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BÜTTIKOFER'S LIBERIA.*

BY

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Mr. Büttikofer says, in his preface, that too much must not be expected of him; he visited Liberia, first of all, for the purpose of studying and making himself acquainted with its zoology. He has none the less made an interesting report upon a country practically unknown, even in the United States, which brought it into being.

Liberia extends along the west coast of Africa, from the Manna River, which flows into the ocean at about 11° 30′ W. Long. (from Greenwich) to the San Pedro River, which enters the sea in W. Long. 6° 40′. The coast line is about 380 miles long, and the limits of the State in the interior (the *Hinterland*, in the convenient phrase of the day), are 80 or 100 miles from the coast. The estimates of area are necessarily even more vague than the boundaries, but there is no reason for objecting

* Reisebilder aus Liberia. Resultate Geographischer, Naturwissenschaftlicher und Ethnographischer Untersuchungen während der Jahre 1879–1882 und 1886–1887. Von J. Büttikofer, Conservator am Zoologischen Reichsmuseum in Leiden. —Mit Karten, Lichtdruck, und Chromolithographischen Tafeln, nebst zahlreichen Textillustrationen.—2 Vols. 8vo. Leiden, 1890.

The illustrations reproduced are from Mr. Büttikofer's book.

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to the figure of 24,000 square miles, given by the Encyclopædia Britannica, though it probably errs on the side of liberality. The calculation of Behm and Wagner gives to the Republic of Liberia a surface of something less than 19,000 square miles; and it is to be remembered that its nominal boundaries on the northwest and the south-east are matters of dispute with its immediate neighbors.

The country is flat and but slightly elevated above the sea. The coast is marked by a great number of capes, all with a westerly direction, and enclosing on their north side little bays that afford good anchorage for vessels. The principal points are Cape Mesurado and Cape Palmas, at which latter the coast turns from a southeasterly to an easterly direction. There are very many rivers and water-courses, but no one of them is of any great importance. The Cavally, the largest of all, is navigable for boats for about 160 miles; but all the streams are obstructed by sand-bars at their mouths and, in their upper course, by cascades and rapids.

Behind the coast and parallel with it is a swamp of from 5 to 15 miles in breadth, with occasional patches of firmer ground and grassy hummocks, and an endless number of channels and reaches, filled with dark and quiet waters. In the rainy season, and sometimes at high tide, all this region becomes a lake. It is covered with a growth of mangroves; and some of the higher spots afford a sustenance to a few inhabitants. Beyond the swamp the soil rises gradually into hills and even into mountains. This rising ground is well peopled and there are settlements of Liberian

colonists along the streams, but the thickly-wooded mountains are almost uninhabited. Beyond the forest extends the Mandingo plain, a broad, undulating pasture land, interspersed with wooded hills, and beyond this plateau, at distances of from ten to twenty days' march, rise the mountains that divide the streams of the Liberian coast from those that belong to the basin of the Niger.

There are two seasons, the dry and the rainy, the former beginning about the end of November and closing at the end of April, when the rainy season sets in, to close in November. The transition from one season to the other is marked by violent storms. The *harmattan*, the cold dry wind from the desert, blows, especially at night, during the months of December and January. Mr. Büttikofer's description of the climate applies to the whole Guinea coast: "The mean temperature is that of a summer day in Europe, and the heat is rarely excessive. The thermometer in the shade generally stands at 77° Fahr., where it remains during the night; and it is not often that it rises beyond 88°. The contrast between the temperature of the day and that of the night is greatest at the time of the *harmattan*. European constitutions do not long resist the effect of this degree of heat in an atmosphere almost always charged with humidity, and it is an axiom on the West African coast that, after a stay of three years in that country, a white man must remove to a cooler climate for at least six months. The Liberian climate is, however, more salubrious than that of Lagos or the Cameroons, and the marsh fever is rarely fatal in Liberia.

"In many of the diseases which affect the organs of

respiration, the patient is benefitted by the air of Liberia; and the typhus fever is almost unknown among the natives. On the whole, it may be said that the climate of West Africa is better than its reputation. The prevalent fever in Liberia is the intermittent, generally of brief duration, but very sudden in its attack.

"A person taken with it feels only that he is weak, but otherwise like himself. If he is in company he talks as usual and answers what is said to him, and then, all at once, his words become unmeaning and disconnected, his eyes stare, and he begins to sing or to laugh like a crazy man. Most diseases in this country leave the blood in a state of partial decomposition, and it is a common saying that, if a white man has lived long on the African coast, the prick of a needle in his flesh will bring out first a drop of water and then a drop of blood. The legs and the feet are apt to be affected with swelling, in the rainy season above all; and dropsy is common. Wounds are very painful and heal with difficulty."

The forests of Liberia have all the density and exuberant richness that characterize the vegetable world of the tropics. The woods are an impenetrable tangle of gigantic trees, bound together by vines and creepers, covered with brilliant flowers, and swarming with birds and insects in endless variety. The soil is fertile, and produces indigo, cotton, coffee, the cacao and the sugar-cane, and every kind of spice. The coffee, which is of excellent quality, and the pepper are indigenous, and the latter once gave a name to the coast.

The larger part of Mr. Büttikofer's book is devoted to his special subject, the zoology of Liberia, and his discoveries in this field, already

well worked by others, are of importance. He presents at the end of his second volume a catalogue of the existing animal forms of Liberia, so far as these have been described. They number: 91 mammals, 245 birds, 51 reptiles and amphibia, 82 fishes, 44 mollusks, 173 insects, 21 crustaceans, and 3 earthworms. Mr. Büttikofer's contributions to the list are 11 mammals, 7 birds, 9 fishes, 4 mollusks, 22 insects, 1 crustacean, and 3 earthworms.

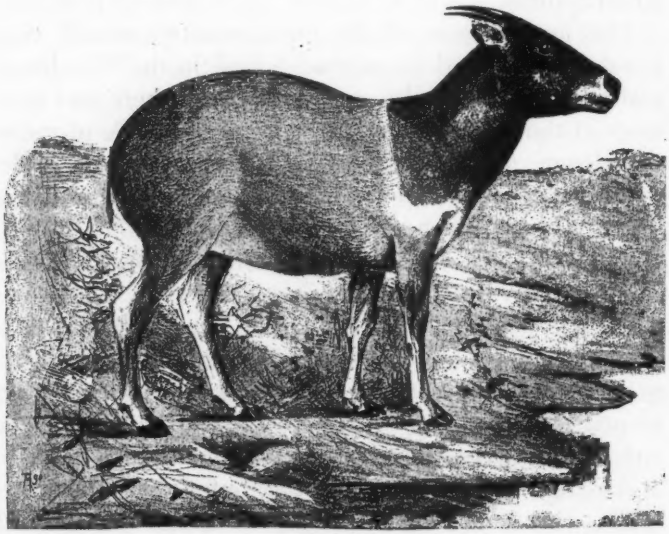
The lion, a lover of the open country, avoids this wooded region and is not even found in the Mandingo plain, but the leopard is met with everywhere and ventures at times into the negro villages; and one of these unwelcome guests has been killed in Monrovia. He does not attack man, but prowls about the goat-folds by night. There are besides a tiger-cat (*F. celidogaster*), larger than the European lynx, and the serval, or bush-cat, both very destructive to the poultry.

In the neighborhood of Grand Cape Mount the ground-squirrels (*Xerus erythropus*) infest the fields of ground-nuts and cassava and gnaw the roots of the plants. They are often tamed like the true squirrels, and learn to take their food from their master's hand.

Among the larger animals the buffalo, or bush-cow, as it is called, is found in every part of the country. It is about the size of the European ox, though it does not stand so high. Very old animals lose their hair, and a specimen in the Leyden Museum has a bare, blackish hide, with here and there a few thin hairs. The horns of the Liberian buffalo are not joined at the base like those of the Cape buffalo, but leave the front of the head free; and instead of curving outwards, they turn

in the plane of the frontal bone backwards, so that the points approach each other and describe the curve of a sickle. Like all of his kind, the Liberian buffalo is a very dangerous enemy, and the natives dread him more than the leopard.

The most remarkable of the nine varieties of the antelope is unquestionably the Tapir Antelope (*Terpone Longiceps*). The male of this variety has not yet



TAPIR ANTELOPE.

been taken, but Mr. Büttikofer secured three females. These were a little below the size of the fallow deer. In its general appearance this antelope recalls the wild buffalo (*Anoa depressicornis*) of Celebes, though it has more slender legs, and in color it is remarkably like the Shabrack tapir. A peculiarity of this antelope is the

pouch-like gland between the belly and the upper thigh.

This gland, in which a lemon might be laid, furnishes a secretion with which the animal rubs down its short hair.

Some distance below Schieffelinsville and in the triangle formed by the Junk River on one side and by its affluents, the Du Queah and the Farmington, on the others, there is a line of wooded heights, surrounded by marshes. It was here that Mr. Büttikofer shot his antelopes. It is only in the rainy season that the hunter can cross the marsh in this place, for there is no water in the dry season to float the canoes, and yet the mud is too deep to be passed on foot. The Tapir Antelope is found in other parts of the country, and one got away from Mr. Büttikofer in the woods behind Fali.

Du Chaillu was the first to discover this peculiar variety, but, though he secured the skull, which is now in the British Museum, he was unable to furnish any account of the animal itself. The long form of the skull suggested the name *longiceps*, bestowed by J. E. Gray in 1865; and from that time to the present nothing has been added to our knowledge of the subject.

This is one among many instances of the occurrence in the Gaboon and in Liberia, of new species, no one of which is to be found in the intermediate districts, though these, and more especially the Gold Coast, have been carefully explored.

Another large variety is the Lyre Antelope (*Eury-ceros euryceros*) called by the Liberians an elk. It resembles the koodoo, but its coat is of a reddish yellow, and the white stripes are more numerous than those

of the koodoo. The horns are very strong and twisted so that the two taken together make the shape of a lyre. The tips of the horns are white for about a hand's breath. The antelope feeds on the leaves of trees and on the climbing plants, and reaches without difficulty up to a height of eight feet.

Elephants are often met with even near the coast, and in the Mandingo plain they are found in great herds. They are hunted, but not often killed, as Mr. Büttikofer concludes from the trifling amount of ivory exported.

A very curious beast is the Liberian river-horse (*Choeropsis liberiensis*), locally known as the sea-cow or water-cow. This is the dwarf among the hippopotami, the full-grown male measuring about 4 feet 7 inches in length and 2 feet 7 inches in height, and the female being still smaller. It is distinguished from the Nile hippopotamus, not only by its diminutive size and other characteristics, but by the fact that it has but two incisors in the lower jaw instead of four. The color of this uncommonly clumsy creature is, in the upper part of the body, a greenish blue-black, which becomes a gray-green on the sides and passes into a yellowish green on the belly. In its habits it resembles the hog rather than its namesake, though it does not live in herds, but wanders in pairs through the forest and with a very wide range, so that though known everywhere it is nowhere frequently encountered. It delights in the forest and the marsh, and takes to the water only when it bathes, or is obliged to cross a stream. Its habit of wandering over a wide area adds to the difficulties of the hunter.

It feeds on branches of trees and plants, and the fruits of the forest, and retreats after foraging, to sleep away a portion of the day in the swamps; and it sleeps so soundly, as the natives of St. Paul told Mr. Büttikofer, that the hunter can approach and kill it without any trouble. Its footprints are smaller and less deeply impressed than those of the elephant; and, where he has passed through the marsh, the hippopotamus leaves the broad track of his body on the surface. The flesh of this animal, especially when young, is succulent and resembles that of the wild swine.

The ant-eaters are divided into two classes, one living in the trees, the other altogether on the ground. The former are frequently tamed and live about the houses. When they are touched they roll themselves up in a ball like a hedgehog, and it takes all the strength of a man to unroll them. The ant-bear, (*Manis gigantea*), lives in holes in the ground or in an old ant-hill, and provides himself with an exit as well as an entrance, because he is too thick and clumsy to turn about in his hole. One of these creatures, killed at Cape Mount, was more than 5 feet long, and weighed 66 pounds.

There are 13 varieties of the monkey tribe in Liberia, and, when Mr. Büttikofer asked about them, he got everywhere the same answer: "Oh, Daddy, plenty live in this country, too much!" The chimpanzee, or *baboon*, as the Liberians call it, is held by them to be a creature of a higher order than other animals. It is killed now and then, but the natives, omnivorous as they are, do not eat its flesh; for the baboon, they say, "is too much like man." They have noticed, among other traits, that he walks erect, that, when he is old, he does

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not climb the trees, but provides himself with a club as a defence against attack, and that, in presence of a foe, he beats his broad breast with his clenched fists and roars so loud that, like the gorilla, he can be heard for a mile around. Emin Pasha's surprising report of the apes that made fires is approached in the following story, told to Mr. Büttikofer by an old hunter:

"You have certainly noticed," he said, "in going through the forest, those remarkable clear and open spaces, of which a man can give no account to himself. They are the baboons' fireplaces. It is the habit of the baboons to imitate men in every possible way, and in these places they gather dry wood together and pile it up in a great heap. Then one of the band makes as if he set fire to it, and the others begin to blow the imaginary flame, at first gently and cautiously, and gradually more and more strongly, until at last their tongues hang out of their mouths. Then they all squat down around the pile of wood with their elbows on their knees, and spread their hands out, as if before the blaze. And they may be seen sometimes in wet weather sitting patiently for half the day, in front of this imaginary fire."

A naturalist must frequently do violence to his own sentiments of humanity, but Mr. Büttikofer's account (Vol. I, pp. 236-237) of the way in which he secured a specimen of the monkey *Colobus ferrugineus*, is too much like a page out of Cumming's repulsive book. A number of these monkeys were enjoying themselves with chatter and play in the tops of the forest trees. Mr. Büttikofer and his guide were able, themselves unseen, to look on and admire the agility and cunning tricks, the petu-

lance, the grimaces, the flight and the escape, suddenly arrested and often begun again, high in the air. But, as the narrator remarks, the hunter does not live by observation alone; he picked out his specimen and sent him a "morning salutation" from the gun. The smoke kept him from seeing the effect of the shot, but the guide said it had done its work, and would not have him shoot again. He waited fully ten minutes. The other monkeys had taken to flight at the report of the gun, and were heard crying and screaming to one another in the distance. The wounded one sat immovable on a branch with one arm around the trunk of the tree and his head bowed, as if he were asleep. "I knew this trick," says Mr. Büttikofer; "there are foxes, and even beetles, that lie as if they were dead, to get up and make off the moment they are unobserved. Another crack, and the hairy acrobat slipped a good way down the trunk. My companion sprang forward, but he was too hasty. The monkey caught all at once in another place, and sat there. I fired again, this time with my double barrelled gun, and brought him tumbling down from point to point till he grasped with one of his hands a branch, as he passed it, and there he hung, as many of his kind do in their last agony, and we had to wait till death relaxed his hold. The speaking, mournful look of a dying monkey's face, its reproachful and yet pleading glance, have always made a deep impression upon me, an impression which I have not even now forgotten, so that, during my second journey, often as the opportunity presented itself, I shot not a single ape, with the exception of one very rare specimen. I was glad, therefore, not to see the death-struggle of the poor victim of

science, and waited patiently for the moment when he should fall to the ground. It was nearly an hour before we heard the branches crack, and then, with a heavy thump, the monkey lay at our feet." Like some other men, Mr. Büttikofer yields only to a strong temptation.

Liberia is divided into four counties, Mesurado, Grand Bassa, Sinoe, and Maryland; the last founded as a separate colony in 1831, and incorporated with Liberia in 1860. The population is estimated at 1,068,000, of which number about 18,000 are of American origin, and form in fact the whole republic. One authority* makes the population nearly 2,000,000; and Mr. Büttikofer considers even the lower figure too large. He says (Vol. II, p. 78): "All that is known with sufficient certainty is that the Colonization Society, during the whole course of its operations, transported to Liberia, in 180 voyages, more than 15,000 negroes and mulattoes, and that nearly 6,000 negroes, found on board of captured slavers, were landed there by cruisers; so that if this imported population has kept up its numbers, it may now count about 20,000 souls."

It is to be remembered, of course, that the American Colonization Society never discontinued its efforts in behalf of Liberia, and that missionaries have always been present to maintain and to advance the tradition of civilized ways and manners among the settlers from America, overweighted at times by the unexpected addition of rescued slaves to be provided for, and always burdened with the responsibility of holding in check the frequently hostile native population. This population

* Consul-general Gudgeon, quoted in the *Almanach de Gotha* for 1891.

is in the tribal condition. Each little chief considers himself a king, to be dealt with as an independent power, and it is to the credit of the Liberians that they have maintained generally friendly relations with these fretful dignitaries. Actual collisions have occurred, but more have been averted by the show of force which the Republic has been enabled to make. Under the law every Liberian citizen between the ages of 16 and 60 * is liable to military duty, and the armed strength of the country amounts to 3,000 men, divided into four regiments, one furnished by each county. Mr. Büttikofer was not impressed by the bearing of the troops he saw, when paraded to celebrate the national anniversary. He says it was not easy to refrain from laughter at the sight of them.

The day he arrived at Monrovia,† Mr. Büttikofer remained indoors till the cool of the evening, and then walked out with a friend from the Dutch Factory to view the capital. It is situated in a depression on the northern slope of the Mesurado promontory. The broad, straight streets lie parallel to the line of the hill-crest, and others cross them at right angles. The squares thus formed are occupied by a single house, or hut, with a *yard*, overgrown with rank weeds, out of which rises a cocoa-palm or, more often, a mango-tree. Every fifth or sixth house is in ruins from the ravages of the white ants (*termites*), and the impression made upon the new-comer, as he climbs the steep streets, is far from pleasant. There are neither horses nor wagons in Liberia, and the streets of Monrovia, where they are

* The *Almanach de Gotha*, 1891, makes the limit 50 years.

† The population of the city is about five thousand.

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not occupied by outcropping masses of spongy laterite, are overgrown with grass and bushes, and serve as a pasture-ground for cows (very finely formed), short-legged goats, smooth-woolled sheep and black swine. Only the footpaths at the sides are kept a little clear of weeds. These features only add, however, to the picturesque effect. Many of the larger brick or stone buildings, and nearly all the wooden ones, are half hidden among the shadowing mango-trees, and in every lot stand singly, or in groups, cocoa-palms, guava, lemon or orange trees, and bushes grow in the window openings and the cracks of the walls, as in a ruined castle.

Among the public buildings is Representative Hall, on Broad Street, where the House of Representatives holds its sessions and the various Departments are established. Behind this is Government Square, with a monument to the Rev. Elijah Johnson, founder of the colony, and father of President Johnson. The Mansion House, the President's dwelling, is a handsome building on Ashmun Street. It was formerly the post-office, but this has been removed to a new building, near the coast. Another house on Ashmun Street accommodates the Senate, the Monthly and Quarterly Courts and the Masonic Lodges. In the rear of this house stands the Jail.

The principal churches are the Baptist, the Methodist, and the Episcopalian, the last a new building, to take the place of one destroyed some years ago by fire. A little removed from the city stands Monrovia College, on a terrace which commands a wide view of the open sea. The Consulates, German, Netherlands, American,

Belgian and Swedish, are in the upper city. In walking through these streets, the traveller is astonished at the size of the private dwellings, hardly to be distinguished, but for the almost universal piazza, or veranda, from the houses of well-to-do people in Europe. Within, the drawing-rooms are often ample and cool, but poorly furnished; and nearly all these buildings date from the prosperous days of Monrovia, when the immigration from America brought in a great deal of money. The commercial establishments, European as well as Liberian, are all on the northern side of the promontory, on the left bank, or *waterside* of the Mesurado River, a little above the point where it breaks through the sand-bank, or bar, and discharges into the cove at the base of the headland. This quarter is a scene of busy traffic all day long with the natives and the farmers, who come down from the interior in their canoes to exchange their produce for foreign goods. Every Saturday afternoon the business is at its height, and the salesmen, with all their activity, can hardly meet the demands of the chaffering, bargaining and capricious negroes.

Mr. Büttikofer was surprised to find that fresh beef was only to be had in Monrovia by subscription for so many pounds, though he readily perceived that the impossibility of keeping dressed beef in such a climate had originated the custom; but he found it less easy to understand why there was no bakery in the town. In general, he remarks, life in the Liberian capital is primitive. There is no hotel, but rooms are to be had in private houses by visitors to Monrovia, and the members of Congress are lodged in this way when they come to

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the yearly sessions, in November. Most of the Europeans, and especially the Germans, are received by their fellow-countrymen. Mr. Büttikofer resided with a Dutchman, Mr. Aenmey, whom he describes as the only white man left in Liberia, since the death of Verdier, the French coffee planter, except those connected with the missions or the foreign factories. Mr. Aenmey is married to a Liberian wife, who owns a coffee plantation on St. Paul's River, and he himself does a general commission business. Mr. Büttikofer and his companion paid for lodging and breakfast, *for both*, one dollar a day.

There are social enjoyments in Monrovia, and Mr. Büttikofer shared in them with friends, whom he does not hesitate to name. At the German Consulate he met several members of Congress and the American Consul, a "genuine full-blooded negro, of herculean stature, and of the finest type, genial and cultivated, and a gentleman from top to toe." He took great interest in the naturalist's researches. There was a good deal of singing, followed by toasts in honor of the various nations represented.

"At first," says Mr. Büttikofer, "we drank beer, a very good Hamburg article, and then wine. The windows were open, but it grew warm in the room and not much less so in our heads. To cool off, we ordered brandy and water, the favorite drink in the tropics for reducing the temperature. I had just responded to a toast, and pulled out my handkerchief to wipe my forehead, quite forgetting that I had folded up in it a panther toad, that I had captured on the way to the Consulate, and this first of my specimens hopped out on

ASHMUN STREET, MONROVIA.

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the table in a shameless fashion, amid the Homeric laughter of the company. The night was far spent before we took our leave."

The Monrovians looked upon the expedition to the interior as a very dangerous undertaking, especially for a small party, but Mr. Büttikofer adhered to his plan; and he says, very reasonably, that in zoological explorations in Africa, the disturbance and clamor inseparable from the movement of a large body of men, defeat the main object by alarming and scattering the wild animals.

In manner the people of Monrovia are pleasant and friendly, and Mr. Büttikofer remarked in the better society something of an aristocratic tone. It is the custom to make formal social calls in the cool of the afternoon, and the ladies study the fashions.

There is a fondness for associations, and six lodges of Freemasons are established, two in Monrovia and one each at St. Paul's River, in Grand Bassa, Sinoe and Cape Palmas. All are under the Grand Lodge of Monrovia. Temperance Societies were begun in 1882, and to their influence must be ascribed the passage of the law raising the duty on spirits to a point, which so affected the revenue from the customs that the law was soon after repealed.

The *Liberia Interior Association, Limited*, formed for the development of the back country, has nothing but its name to show.

These various efforts at organization, however abortive, are at least in the right line; but what can be more grotesque than the knightly *Order of African Redemption*, founded January 13, 1879? Mr. Büttikofer has "only this to say of it; that its insignia are well-finished, and that the Government has not distributed them with

a lavish hand." There may be more than one reason for this forbearance.

The Liberians are Protestants in religion, but the Constitution guarantees freedom and equal rights to all forms of faith, and the withdrawal of the French Catholic Mission in 1887 was entirely voluntary. The fervor of the people in religious matters sometimes interferes with the other concerns of life. Mr. Büttikofer quotes the following passage from the Grand Bassa School Inspector's Report, of November 23, 1882: "The rainy season and the revivals break in upon some of our schools for two or three weeks, and the revivals so much the more that most of the schools are kept in the churches, and these are occupied on such occasions by the anxious inquirers, who spend their whole time there, praying, sleeping and dreaming, so that during this period the business of instruction is necessarily suspended."

Even with these interruptions, however, the Liberian schools are fairly successful, and the Liberia College in Monrovia has done good work, though complaint is made that its requirements are too high for the best pupils from the other institutions. Scholars are sent from Liberia to the American colleges and universities, principally for instruction in theology and in medicine; and medical men abound in the African republic. Scholarship and culture have always been represented, and Mr. Büttikofer assures us that he found everywhere an appreciation of music and song. To a full-fledged State, with its own order of knighthood, a National Anthem was indispensable, and a Liberian poet, Olmstead Luca, was found to produce it. Mr. Büttikofer prints

the words and the music, which is better than the verses, of this composition :

All hail, Liberia, hail !
All hail, Liberia, hail !
This glorious land of liberty shall long be ours.
Though new her name,
Green be her fame,
And mighty be her pow'rs !

In joy and gladness, with our hearts united,
We'll shout the freedom of a race benighted.
Long live Liberia, happy land,
A home of glorious liberty, by God's command.

All hail, Liberia, hail !
In union strong, success is sure,
We cannot fail.
With God above
Our rights to prove
We will the world assail.

With heart and hand our country's cause defending,
We'll meet the foe with valor unpretending.
Long live Liberia, happy land,
A home of glorious liberty, by God's command.

The town life of Liberia has another centre in Harper, the sea-port near Cape Palmas. Dr. Nachtigal's grave is still shown at this place. He died on board the German man-of-war *Möwe*, April 20, 1885, on the homeward voyage from Kamerun, and his body has recently been removed to that colony.

The plantations and farms in Liberia do not extend, for the most part, to any great distance inland, but keep close to the neighborhood of the towns and stations, and along the streams. The houses and outbuildings are all of wood, and whitewashed, and they are raised above the ground on posts from 4 to 6 or 7 feet in height.

In general appearance they resemble the ruder houses

of the Southern and Western States of America. The sides of the buildings are made of unplaned boards, nailed across the frame, and the roofs are covered with heavy shingles. The doors and the window-shutters are of rough boards, and, except in a very few instances, there is no such thing to be found as window-glass.

The furniture is of the simplest; a few plain chairs, a rocking-chair, a coarse table, one or two chests, wide bedsteads with hard mattresses, make up the list, to which may sometimes be added a cheap looking-glass and a few prints, with or without frames. A clock is rarely seen, even in the town houses, and it is not often needed in a land where the sun rises and set at 6 o'clock, all the year round, and is directly overhead at midday.

The returns of the commerce and revenue of Liberia for 1883–1884—the latest attainable—show an export of 931,341 gallons of palm-oil, 429,667 pounds of coffee, and 130,131 pounds of India-rubber. The revenue for 1883–1884 was 174,014 dollars, and the expenditure 157,465 dollars. According to the *Statesman's Year Book*, for 1889, the value of the Liberian exports for 1883 was £200,000 ($1,000,000), and that of the imports £150,000 ($750,000). The estimated revenue for 1888 was £35,000 ($175,000), and the expenditure £33,000 ($165,000).

The entire back-country of Liberia and some parts of the coast are possessed by the native tribes. The most important of these are: the VEI, in the Grand Cape Mount district, between the Manna and the Little Cape Mount River; the DEH, between the latter and St. Paul's River; the GOLA (or Gura), a powerful tribe on the middle St. Paul's River; the MAMBA, behind Mon-

rovia, and between the Mesurado and the Junk River; the QUEAH, to the eastward, on the Du Queah River; and the great tribe of the PESSY, whose country is behind the region occupied by the two preceding tribes. The country of the BASSA is bounded on the south-west by the sea, on the north-west by the Farmington River, north-east by the river Sangwin, and towards the interior by the GIBI, and other tribes. The KRU district, the home of the *Kruboys*, so well-known on the Guinea coast, stretches from the Sangwin to the Grand Sesters River. Next to the Kru, and occupying the coast from Cape Palmas to the San Pedro River are the GREBO, closely allied to the Kru in speech and in blood, *Grebo* being the name by which the Kru are known among themselves.

The Kruboys are good seamen, and in demand for wages of six dollars a month, and expenses; the latter being the cost of three pints of rice and a little grog, daily. They are hired through a head-man, who requires a document in writing (known on the Guinea coast as a *book*) as proof of the contract, and pockets as his commission the whole of the first month's wages, paid in advance. In the Liberian ports these contracts are made with a Government officer, whose duty it is to see that they are not made use of to cover slave-dealing, or other illegal enterprises. Some years ago, according to Mr. Büttikofer (Vol. II., p. 192, *note*), President Johnson refused to allow the captain of an English man-of-war to engage Kruboys, who were to be employed in military duty in Egypt. An agent of the Panama Canal Co. was, however, permitted to hire natives of Liberia for service under the stipulation that, when their engage-

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ment expired, they should be sent back to their home; a stipulation faithfully kept, it is added, "in so far, at least, as the men lived to come back." Similar engagements of Liberians and of tribesmen have been recently made for work on the Congo railroad, and other enterprises in the Free State.

The *book* plays a most important part in the daily life of the Liberian workmen. It makes no difference whether the man himself is able to read; he is perfectly contented when he sees the agreement put down in writing, and he calls everything written a *book*, even a bit of a newspaper. He preserves all these *books* with the greatest care, and can tell accurately the meaning and date, as well as the value, of each one.

The Krumen have the genuine sailor's contempt for landsmen and their ways, and leave all the house and field work to the women and children, and the slaves. They make and repair their own canoes, however, and with wonderful skill. They are generally well dressed and fond of bedecking themselves with finery, such as the cast-off coats of English naval officers; and they delight in carrying an umbrella. Individually, they are known by the nicknames bestowed upon them by the English seamen: *Half a Dollar*, *Pea Soup*, *Bottled Beer*, *Flying Jib*, etc.

The greater part of the Liberian negro tribes are under their own princes or head-men, with numerous inferior chiefs exercising authority under the supreme head. These chieftains, no matter how limited their power, assume the title of king, in imitation of their superior, and the more eminent among them are, in fact, quite equal in influence to the actual king, in time of

peace. The king maintains no standing army, and does not surround himself with a retinue of courtiers and attendants, such as wait upon the princes in other parts of Africa. The conditions of his life are, on the contrary, rather mean in the eyes of Europeans. He exacts no universal tribute from his subjects, and his riches consist in the number of his women and slaves. In war-time, however, there is no limit to his authority, and other war-lords might envy him. Simple and unpretentious as he is at home, every little chief makes the greatest possible parade when he sets out on a journey, with his high councillors and life-guards, and a bevy of women, dressed in their gowns and ornaments. The men are armed with long swords, mostly old European cavalry-sabres, horse pistols, and daggers, often beautifully finished, of native manufacture. Every one, from the king down, wears his pocket handkerchief round the middle, under his toga, and all go barefoot.

On the death of a chief, his dignity descends to his eldest son, unless the deceased leaves a brother. In this case the brother becomes king, and it is not till his death that the succession devolves upon the son of the former king.

War is carried on among these tribes in guerrilla fashion and hardly ever in the open field. Their operations are confined to night-attacks and incursions, with destruction of the places they can set on fire ; though it sometimes happens that siege is laid to a fortified position, such as the residence of a chief. These residences are often surrounded by palisades, or high, thick walls of clay, baked in the sun.

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The incursions take place when the rice is ripening; and spies, called *softly men*, are sent in to report upon the district marked for attack; a dangerous service, for they are killed without pity, when discovered.

Polygamy is practised, and a rich man is known by the number of his wives and slaves. Mr. Büttikofer has known chiefs, who had 20, 30, and even 50 wives; but in every such number there is always one, who is known as the *head-woman*, and is superior in dignity to the others. Slaves are not badly treated, but are regarded as members of the family to which they belong, though the master readily sells them on occasion, as, for instance, to raise money to pay a debt.

The average price of a slave is 15 dollars, and no one would think of paying more than 20 dollars.

A chief frequently possesses many hundred slaves, mostly engaged in cultivating the soil, and settles them in a village by themselves. One such village is Toöcoro, on the Morfi River, the property of a Mr. Cole, who was himself originally a slave, but has become a land owner.

The native handiwork in leather, pottery, ornamental work and arms, shows a great deal of skill and taste, and something of the Oriental eye for contrasts of color. Mr. Büttikofer's judgment on the character of the negroes is that they are children of the moment: "It is according to the present circumstances that they are good or bad, willing or obstinate, honest or thievish, true or false; and it is best, in a word, always to show that you are on your guard and hold them steadily under sharp control." (Vol. II, p. 297.)

Many of these natives have received instruction in

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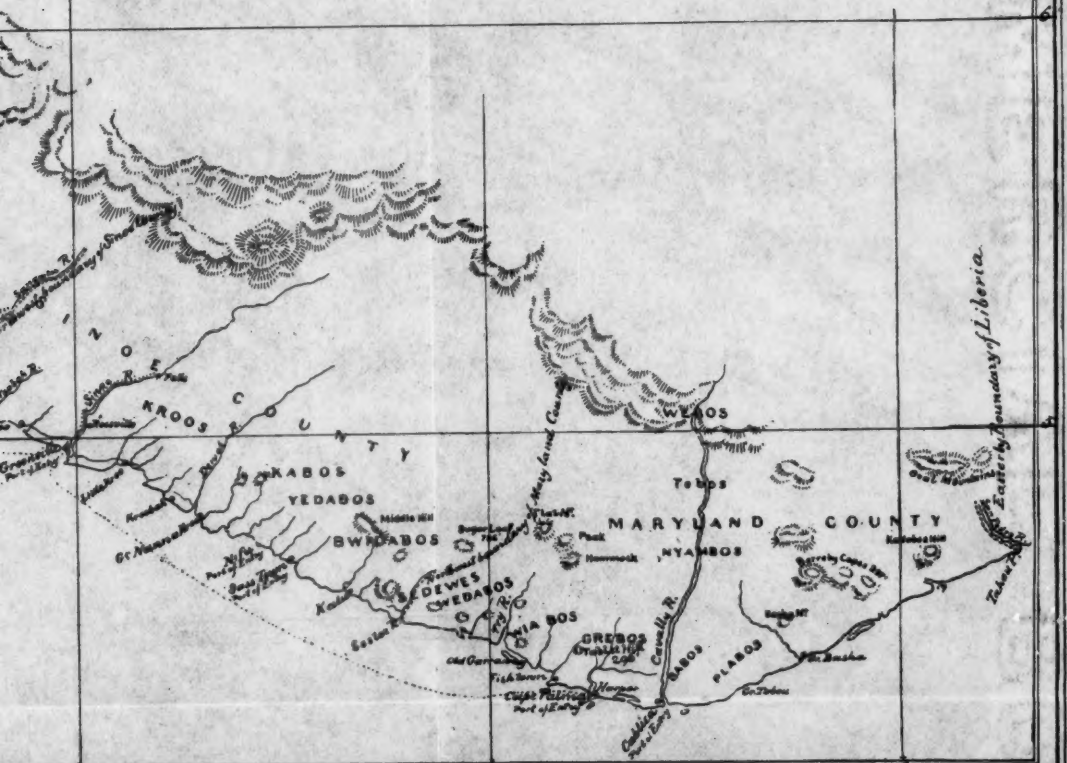
LIB
J.
RUSY COUNTRY
CONDO
BOATSWAIN
COUNTRY
BARLINE COUNTRY
COUNTRY
VEY COUNTRY
MESS
COUNTRY
COLAH COUNTRY
PESSY COUNTRY
QUEAH COUNTRY
GIBBY COUNTRY
DEH COUNTRY
GAMBA COUNTRY
Mühlenburg Mission
White Plains
New York
New Georgia
Virginia
Monrovia
Paynesville
Hill Town
Marshall
Caldwell
Millsburg
Careysburg
Bensonville
Upper Buchanan
Half Cape Mount
Cape Mesurado
Little Bassa
Hartford
FISHTAIL MT
Bassa Co.
Grand Bassa
Grand Cess
Sinoe
Greenville
Bassa
Cape Palmas
Bexley
Bukhgomah
Bassa
Sinoe
Cape Palmas
Bexley
Greenville
Grand Cess
Grand Bassa
Bassa

BERIA

1 : 1000 000
after
J. BÜTTIKOFER.

Explanation :

Traveling Routes and Hunting Stations.
Waterfalls and Rapids.
To Town.
R. River.
Pt Point.



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the Mission Schools, but the result of the efforts to civilize them is not encouraging, so far as Mr. Büttikofer was able to see. When the negro leaves the Mission School it is with no thought of bettering the condition of his people. He lays aside the clothes he has been taught to wear, ties a handkerchief about his loins, and goes back to the old ways. With some inconsistency, Mr. Büttikofer declares on the next page (Vol. II, p. 346) that these very natives are as full of promise as the white men :

" It frequently happens in America at the present day that these young Africans take the doctor's degree, and I am almost entirely convinced that the negro is not less capable of culture than the white man, as soon as the opportunity for study is given to him."

The pagan faiths of the Guinea coast are still what they were in the time of Dapper, whose accuracy is highly praised by Mr. Büttikofer. Of the two religions that press upon this native paganism, Mr. Büttikofer says (Vol. II, pp. 340–341) : " The efforts of the American missionaries have no very brilliant results to show, for the natives have remained almost indifferent in their attitude towards Christianity. Islam makes greater progress, and presses forward slowly, but steadily, from the interior to the coast. The Mandingoes of the broad *hinterland* are all Mohammedans, as are also, in great part, the Busy and the Pessy tribes ; but Islam has not yet a firm foothold among the jealous and exclusive Golah and the others of the Deh family, and particularly among the Vei." The change to the faith of Islam is made very easy for the fetish-worshipper. He has only to renounce the indulgence in strong drink

and the eating of unclean flesh; and the Mandingo dervish is satisfied when he brings the unbelievers to acknowledge the true religion, and to exchange their own unsightly fetish-amulets for the more elegant and far more efficacious talismans which he offers.

The Mandingoes are much more scrupulous in the observance of the duties prescribed by Mohammedanism. Their attendance at the mosque is regular; they repeat their prayers and perform all the rites enjoined. In all their towns and larger villages there are schools, in which the boys are instructed in religion and in the reading and writing of passages from the Koran. There are among them not a few learned men, who possess a number of Arabic manuscripts and give lessons to young men, so that the knowledge of the Arabic language is very widely spread.

Schools of a similar character are conducted, also, by the dervishes, who are the pioneers of Islam in the movement towards the coast, and settle themselves in the larger communities among the other tribes, such as the Vei, and there carry on the work of proselytism in the measure of their power. The same process goes on among the Busy and the Pessy. The Mandingo priest, once fairly settled, takes to himself a wife. She is soon followed by a second, and then, with the growth of his school, the priest calls in an associate, who must also have a house. After him come in by degrees blacksmiths, leather-workers and other handicraftsmen, who give employment to the people of the tribe, and build up in this way one settlement after another, till the community is so large that a special building is required and is dedicated as a mosque.

Mr. Büttikofer thinks that the Mandingoes must be regarded as the practical lords of the land.

The Christian missionary work has two aims: the maintenance of religious faith and civilization among the Liberians, and the conversion of the heathen.

If but little has been done in this latter direction, it must be remembered that great and peculiar difficulties are to be encountered. Mr. Büttikofer shows how the well-founded hope of attracting the natives to civilized ways by the education of their girls has been defeated by the social customs of the tribes. A girl represents in the family a certain money value, and is disposed of in marriage by her parents to the man, often a polygamist, who can pay the required amount.

In this way the time and labor bestowed upon the Christian education of a native girl are found to have been wasted. To meet this evil the Protestant Episcopal mission adopted a system of purchasing the girl by a payment of 15, or more, dollars, to secure the right to give her in marriage to a Christian; but means were lacking to give development to this system, and the missionaries had to endure the grief of seeing a girl of excellent promise withdrawn from their care by her parents, and handed over to a pagan who was rich enough to refund the money advanced to secure the girl's freedom.

"It is to be understood, of course," says Mr. Büttikofer in his conclusion (Vol. II, pp. 344–345), "that it cannot enter into my purpose to draw a parallel between the two rival monotheistic religions, or to prognosticate which of the two is to control the future of the black fetish-worshippers; but the unprejudiced observer, who

follows the vigorous expansion of Islam in the inner country, and contrasts with it the proportionately feeble results of the Christian missionary activity, must soon come to a clear determination on this point. It is not to be doubted that the Mohammedan religion also exercises a civilizing influence upon the natives.

"It is certain, also, that it suits them, for, together with its great simplicity, it permits polygamy and sets before them the well-known sensual joys of Paradise.

"'God is God, and Mohammed is the prophet of God.' Even the dull intellect of the negro can take in this clear and simple principle, while on the other hand it is hard for him to form a definite conception of Christianity, with all its involved dogmas. Nor is it to be wondered at that the negro remains indifferent to Christianity, in so far as it brings him no material advantage, and least of all that he is not won over by its rigidly ascetic view of life, and its monogamy. Much depends, moreover, upon the method of presenting Christian doctrine to the heathen. It is nothing less than perverse to hammer at the negro with a lifeless theology, as is even yet done in many a place, and to seek for salvation in the making of proselytes and the winning of souls."

Mr. Büttikofer might have uttered himself in other language if it had been his purpose to compare the two religions; and he would approve, at least in part, the distinction between them set forth by Dr. Blyden, himself a negro, and a clergyman:

"Mohammedanism, in Africa, has left the native master of himself and of his home; but wherever Christianity has been able to establish itself, with the

exception of Liberia, foreigners have taken possession of the country, and, in some places, rule the natives with oppressive rigor."*

Mr. Büttikofer, a disinterested observer, looks to an immigration from the United States for the supply of the new blood imperatively called for in Liberia. Dr. Blyden has an abiding faith in the saving power of the Christian civilization already planted, and its eventual supremacy over the tribes of the interior.

It cannot be believed that there will be an emigration from the United States to Liberia, for the colony exercises no attractive influence upon the Americans of African blood. The sentiment which founded the American Colonization Society has spent its power. The times are changed and the American negroes are changed with them, nor would it be easy to find many who cherish the thought of Africa as their fatherland.

While it is true that Liberia has made no effort to extend its rule or to assert its authority over the native tribes, this negative attitude is even more due to inherent weakness than to the Christian spirit of the Republic. It must be admitted that there is a lack of vitality in the civilization which maintains, for a total population of 20,000, a college empowered to confer degrees for scholarship in Greek and Latin and Arabic, while there is neither a road nor a paved street in the whole country; and those who are interested in the Liberian experiment may well look forward with misgivings to the arrival of the conquering Mohammedans at Cape Palmas and Monrovia.

* *Christianity, Islam and the Negro Race*, p. 354.

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NATIVE COPPER OF MICHIGAN.

BY

E. B. HINSDALE.

Few people have any knowledge of the native copper of Michigan, what it is, where it is obtained, or how it is procured and prepared for market ; nor is the magnitude of the industry understood. Last year there were produced 105,586,000 pounds of refined copper, which, at 17 cents per pound, about the price of copper at this writing, would amount to the sum of $18,045,620. It is a rapidly-growing industry, and the new openings and additional machinery, now fast getting ready for operation, point to an increased production of at least 20 per cent. in pounds of copper for next year.

About $250,000,000 in value have been taken from these famous mines, and yet no one suggests a probable limit to the supply or dares predict the extent of the possible future development of this great industry. Native copper is so called because each particular piece of copper as it is mined, whether it be many tons in weight or a fine particle of dust, is pure copper of the same kind and quality as the ingot copper of the world's markets. It is not alloyed with any other mineral, except it carries a trace of silver, and pure silver in small quantities is often found imbedded in it.

It was this purity of the metal that made these mines an object of interest to an ancient people, who discovered

and worked them extensively in some prehistoric age. Those who look at a map of Lake Superior will see a peninsula called Keweenaw Point, that juts out into the lake from the southerly shore in a northeasterly direction. It is a wee, small bit of land in this world to contain so much wealth and to possess so much romantic interest. These famous mines are situated along a line about in the middle of this peninsula, running from south-west to north-east, and copper has been found at various points along this line for about fifty miles. Ancient works have been found at numerous points for about thirty miles.

There is a deep mystery about these old works that it is impossible to fathom. In the opinion of many, they were worked by a race of men that preceded the Indian races found here when Columbus discovered this continent; but others think that they were worked by the ancestors of the Indian races here when white men first penetrated this then far-distant country. This question can never be conclusively settled. This much is certain, that, whoever worked these mines in ancient days, all knowledge of the existence of the mines was gone from the Indians when white men rediscovered them.

These ancient miners were a diligent and persistent people. They seemed to know nothing of smelting copper, for there are no traces of molten copper. They were after pieces of suitable size to work by cold hammering into useful articles and ornaments. They understood the use of fire in softening the rocks to enable them to break away the rock from the masses of copper. They knew nothing of drilling or blasting, but used the

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stone hammer freely. More than ten cart loads of stone hammers were found in the vicinity of the Minnesota mine. One of the larger class weighed thirty-nine and one-half pounds, while smaller specimens weighed five or six pounds each.

These stone hammers have a crease around them, obviously for a withe handle. Such handles are made of tough saplings or small trees, that will bend around the stone and, when firmly bound in their place by strips of strong bark, make a hammer about as effective as a modern blacksmith's sledge hammer. Ashes and wood coals have been found on the rocks at the bottom of the working, showing the use of fire to prepare the way for the effective use of the stone hammer. These mines must have been worked for centuries, judging by the extent of the works.

In one place the excavation was about 50 feet deep, and at the bottom were found timbers forming a scaffolding, and a large sheet of copper was discovered there. In another place in one of the old pits was found a mass of copper that weighed forty-six tons. At another point the excavation was twenty-six feet deep. In another opening at the depth of eighteen feet a mass of copper weighing over six tons was found, raised about five feet from its native bed by the ancients and secured there on oaken props. Every projecting point had been taken off by these people, so that the exposed surface was smooth.

Wherever the ancients found copper from a few pounds weight to a few hundred pounds in weight they were obviously able to utilize them, but the large masses were too heavy for them to handle. Their habit was to

throw the broken stone behind them as they progressed with their works. Many of their workings are ten feet or less in depth. The copper obtained by these people was wrought cold into axes, chisels, knives, spear heads, arrow heads, bracelets, buttons, beads, etc. It has been observed that very few of these articles are found near the mines.

There is a piece of low arable land a few miles from the mines, near the mouth of a small stream that runs into Keweenaw Bay, which the old miners probably used as their camping ground, for here has been the principal find of ancient tools on Keweenaw Point. These copper tools have been frequently found in the old earthworks in Wisconsin, Ohio and Canada, and the writer thinks that he has read of their being found further south in the Mississippi Valley. There are no human remains found near the workings nor evidences of human habitations.

The extreme severity of the winters and the absence of any evidence of permanent occupation has led many to suppose that the ancient miners migrated from some warmer climate in the spring and returned in the autumn, perhaps bearing their dead away with them. Whoever they were, whatever their habits were, many centuries have passed since they last worked these mines. Their trenches and openings have become filled up, or nearly so. Monstrous trees have grown over their works and fallen to decay, other generations of large trees have grown and perhaps fallen and decayed; how many, no one can tell. All that is known is that when the mines were rediscovered decayed trunks of large trees were lying over the works, with a heavy growth of

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live timber then standing on the ground. Over one of these works in the Minnesota Mine, Mr. Knapp reports that a hemlock tree which he felled showed 395 annular rings.

The desire to fix a time when these old works were closed is intense, but cannot be gratified. It would be curious to compare the civilization of Europe with that of these people at the same time, if we could fix the date. What was Europe doing when these stalwart men of the northwest were swinging those tons of stone hammers in a no mean effort to accomplish a feat of mining, that would have been creditable a few years ago to our boasted civilization?

Had Columbus pointed the prow of his ship to these shores at the very time these men were industriously working these mines, or had the forest trees then grown over them? Dates would be interesting, but they cannot be established. Of one thing we are certain, a great modern industry has been, or, more properly speaking, is now being, built upon this ancient industry.

The Jesuits who visited this country about two hundred years ago learned from the Indians that there was copper in the country. Claude Allouez, who visited Lake Superior in 1666, states that pieces of copper weighing from ten to twenty pounds were frequently found by the savages. Pieces of copper that have been carried by the convulsions of nature from their original bed are found many miles from the copper veins. In 1864 a mass weighing about eighteen tons was found loose on the drift covering the rock near Portage Lake.

A copper rock now on the Government grounds in Washington has a strange history. It was brought from

the banks of the Ontonagon River. It is supposed to have been removed by the ancients in some way to the banks of the river, and, in an attempt to raft it over, it got away from them and sank to the bottom. When the water was low it projected above the surface and was an object of religious veneration. It is said to have been known for over 200 years. The Jesuits heard of it from the Indian priests, who, however, refused to conduct the missionaries to the spot where it lay, on account of a superstitious belief that when the white men had seen it the Indians would be destroyed: a belief not without reason.

In 1820 General Cass sent a party of men to fetch the rock away, but, owing to its great weight, they did not succeed. Another attempt was made to remove it in 1827, but as the river was high and it was pretty much covered with water, this attempt failed. In 1842 another attempt was more successful. It was removed to the mouth of the river. A Mr. Eldred claimed to own it. It was afterwards claimed by a Government agent, and finally removed to Washington. By act of Congress Mr. Eldred was paid $5,655 for it.

The first attempt at mining within historical times was in 1771, but the location was not skilfully chosen and it was a failure. It was not until the report of Dr. Douglass Houghton, State Geologist, in 1841, that there was any public knowledge of native copper in place on Keweenaw Point. This report awakened great interest in this country, and explorations and developments have gone on with generally increasing interest to this date. A history of the early struggles and trials of those who took part in the development of this country would be

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exceedingly interesting. It is a pity the task is not undertaken by some competent person before death has removed the last of the actors who could tell the tale.

It was not until 1844, after the Indian titles were extinguished, that mining began in earnest by white men. Hundreds of companies were unwisely organized. Speculation was rife. Works were begun under great difficulties, and knowledge of mining was limited. Capital was also limited. The usual result followed—a grand collapse—in 1847. Disappointment and failure were general, with some notable exceptions. The methods of mining then employed were primitive. The country is full of abandoned works, and many of them are now being reopened with fresh capital.

In the early days the mining was, in some of its methods, not unlike those of the ancient miners; but some modern ideas were introduced. Drilling, blasting, and stamping in a crude way were employed. In all cases, except where large masses of copper were found, the ore was roasted in burrows. These were formed by layers of wood and layers of ore. In the roasting process care was taken not to have the fire hot enough to melt the copper. The large pieces of copper were sent to the smelting works, the smaller pieces of roasted ore were stamped and washed, and the resulting copper was put in barrels and sent to the smelter. This was called "barrel work."

The masses of copper found in the earlier days have not been equalled in size in later years. In fact, large masses of copper are not as profitable to find, owing to the difficulty and expense of getting them out and cutting them up. Among the numerous masses of copper,

the most notable was found in the Minnesota Mine, in 1857. It was difficult to dislodge it from its native bed. Charges of powder, first of 125 pounds, gradually increased to 550 pounds, failed to dislodge it. Finally a charge of 750 pounds, securely tamped under it, was fired, with the result of lifting from its bed without fracture a mass of copper 46 feet long, 18 feet in breadth, and 9 feet thick, the latter two measurements being taken at the greatest distance, the whole mass weighing about five hundred tons. In cutting it up fifteen tons of chips of copper were made.

In the early days of mining there was great difficulty experienced from the isolation of the country and want of transportation facilities. There were no railroads or telegraphs, and the only means of transportation was by water. All supplies for men and animals had to be brought up before navigation closed. The winters were long and severe. When once the cold weather began the people were as isolated from the rest of the world as the Laplanders. For from six to eight months they had little or no communication from "below." An occasional mail would be brought in by hardy adventurers on snow shoes, with dog trains.

One of the pioneers related to me that the news of the first President Harrison's election in November, 1840, and of his death the following April, came in the same mail about two months after his death. With all their trials and deprivations those who wintered here had many social enjoyments and much real pleasure. There was much good society among those in charge of the works, and innumerable stories are told of the good times they had in the old days of forty years ago.

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In those days men walked ten miles on snow shoes to make New Year's calls. A short neighborly call would usually last at least a week.

All this is changed now. Railroads, telegraphs, telephones, and electric lights and a greatly developed industry have inaugurated a new era. The theatre of principal mining interest has changed. The greatest mine for many years has been the Calumet and Hecla. The development of this mine began about 1867. Its progress has been wonderful, and to-day it ranks as one of the greatest copper mines in the world. Its works are situated on what is locally known as the Calumet and Hecla Conglomerate.

This is a vein at its mine of from six to twenty-eight feet in thickness, generally carrying copper interspersed through the rock, the larger pieces, with rare exceptions, usually weighing only a few ounces and from that of all sizes down to dust as fine as gold dust. No very large masses of copper have been found, none worthy of notice compared with those before referred to. It is the universality of the small pieces of copper through such a vast quantity of rock that makes the marvellous wealth of this mine, although in their explorations the workmen have found long stretches of rock too lean to be worth milling.

In some of their shafts paying rock has been found near the surface. They were fortunate in opening such shafts in very rich rock near the surface in their early days, which gave the company its financial strength, enabling it to pay good dividends and push explorations. The shafts extend for about two miles along the vein, and are fourteen in number. Many of the shafts have

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been sunk to a great depth before finding paying rock. One of the latest explorations descended 2,300 feet before paying rock was found. All of the shafts have found paying rock when pushed deep enough, and all are richer at their greatest depth than at the surface.

A study of these results as well as the results at other mines, has led to the conclusion that the most profitable mining is to be found at great depths. The method of mining by this company up to this writing has been to sink their shafts down on the slope of the vein. Captain Daniell, one of the ablest miners of that country, who has been for twelve years in charge of the Osceola Mine, reasoning out the probable course and character of this wonderful vein, backed by abundant capital, inaugurated a bold and original idea of mining. Selecting a location beyond the lands of the Calumet and Hecla and above the vein he calculated that a perpendicular shaft should strike the vein at a depth of 2,300 feet. It was a bold enterprise to go out into the open country and lay out the work upon land that showed no indications of copper at the surface, and enter upon a labor of years to find a vein of copper, the continuity of which was unknown except by logical reasoning, from the surface openings of the Calumet and Hecla mine.

What freaks of nature in the bowels of the earth might defeat his logic no man could tell. Patiently year after year the work went on, and at the end of three years and four months the expected vein was found within thirty feet of the expected depth. The result was the opening of the famous Tamarack Mine, which, with other mines now opening by the same men, bid fair to rival the Calumet and Hecla. The Tama-

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rack Mine has been in successful operation for four years.

Encouraged by this success, a second shaft has been sunk on the same location, which has just come into successful operation (August, 1890). The vein, where pierced by these two shafts, is of the same general character as that in the Calumet and Hecla. On another location the same company has sunk two shafts to a depth of 2,300 feet, but do not expect to reach the copper until November next at a depth of about 2,500 feet. A third mine of two shafts has been commenced on still another location, that has attained a depth of only 500 feet, but is expected to be sunk about 3,800 feet before reaching copper. These are bold departures from the traditional method of mining in this country, which heretofore had been to sink on the slope of the vein.

Within about two years ago the Calumet and Hecla commenced an enormous vertical shaft, intending to cut the vein on their land at a point below their present workings at a depth of about 3,700 feet. It will take nearly two years before this shaft can reach the vein. It will be interesting to note the result of all these unfinished works. If the calculations of their projectors are not at fault, they will put into the shade all past achievements in copper mining in this country.

Modern methods of mining and milling have made great advances over old methods. The rock is no longer roasted. That method was abandoned years ago. Black powder has been superseded by high explosives that thrŏw down much larger masses of rock. The hand drill has given place to drills driven by compressed

air. All the rock is stamped in mills of great power. In 1860 a report was made of a mill that stamped thirty-three tons per head per day. Now a single head will stamp 260 tons per day.

The method of procedure is to raise the rock to the surface in such lumps as it is left in by the blast in the mine. Here the large pieces are put through stone crushers that break it into lumps not larger than a man's fist. It is then dumped into cars and taken about four miles to the border of a small lake, where it is stamped and washed, a process called milling. After the earthy matter is worked out as far as practicable, it is sent to the smelter, where it is cast into the various forms of copper required in the markets of the world.

It is difficult in a few words to give an idea of the magnitude of these operations. The details would be tiresome. A few facts will serve in some measure as indices to lead the mind to comprehend the subject. The people who live almost together upon the group of mines, of which the Calumet and Hecla is the principal one, number about 12,000, all of whom are either directly or indirectly supported by the mines. About half as many more are supported around the mills and smelting works.

All the mines have to pump water up to their mills to wash the earthy matter from the copper. The amount of water pumped daily by the Calumet and Hecla to its mill is about thirty-four millions of gallons, a good supply for a city. But more than this, this company has nearly completed a pump that will throw about fifty millions of gallons a day, or an amount in excess of half the water supply of the great city of New York prior

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to July, 1890. The dividends this company has made to its stockholders exceed $35,000,000. It is only by such comparisons that the mind of the general reader is brought to a comprehension of these great works.

The amount of sand washed into the Portage Lake became so great that it threatened to stop navigation, and the United States Government has had to interfere and prevent further use of the lake. Many acres of made land are now in the lake from these washings. At present most of the mills are on Torch Lake, but the time will come when Lake Superior will have to be the dumping ground.

The Calumet and Hecla sends daily to the smelting works about 135 tons of mineral, as the copper is called after stamping and washing, which, when smelted, will produce about ninety-five tons of pure copper daily. The greatest depth of the Calumet and Hecla is over 3,000 feet, and the greatest depth of the Tamarack is about 2,850 feet. These two mines, the greatest producers, are selected by way of illustration. Proper limits forbid further details in this paper, although the operations of the Quincy, the Atlantic, the Osceola, and others would be interesting.

The native copper of these mines is the only considerable body of such copper yet found in the world. The character of the mine improves, the greater the depths to which they are worked. In this respect this district is different from many others. The Cornwall mines of England, as they went down, gradually changed to tin mines. In Montana the mines are of decreasing value when worked below the water level of the country. The Chilian mines, that once dictated

the price of copper for the world, can no longer be worked with much profit, and are not a serious factor in the market. The native copper of Michigan has more tensile strength and greater conductivity for electrical purposes than any other. It commands the highest price in the market for its better adaptability for many kinds of manufacturing purposes.

In the deep mining of this country no particular change is noticed in the temperature of the mines as they go down. Water is not encountered in troublesome quantities. The veins seem to be almost hermetically sealed. These are all favorable conditions for mining. A striking feature of these improvements is the ponderous machinery, engines, pumps, stamps, and fly wheel, as fine as any in the world, housed in large brick and stone buildings with iron roofs. All this in a place where the "forest primeval" stood in its solemn stillness thirty years ago. The trees were of phenomenal size and the sunshine hardly penetrated their close and tangled growth. Even now the stumps have to be grubbed out to make way for advancing improvements.

Such are the Lake Superior copper mines as they appeared to me in my leisure hours of outing in 1890. Great as have been their strides in the past, it seems to me that the men in charge are just beginning to understand the business and country. Wonderful as the improvements have been, others are to follow. Advanced thinkers are looking forward to the time when electricity will come to their aid to drive their drills and perhaps light these subterranean caverns. The time will also come when a limit will be reached for hoisting by steam power from the surface.

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When I suggested this difficulty to Captian Daniell his quick response was: "Electricity can be used to bring the ore within reach of a surface hoist." At the suggestion of expense he said: "That is not a very material factor." His answer suggested large thoughts of future possibilities. It is refreshing to get away from the rut of metropolitan life and be with men who are doing the really big things in this world, stalwart thinkers who form great plans and patiently carry them out. Whenever a just estimate of the really great men of the land is made up, a successful mining captain or superintendent will hold no mean rank.

August, 1890.

SIR JOHN FRANKLIN'S LIFE, BY CAPTAIN A. MARKHAM, R. N.

The Editor of the BULLETIN.

SIR :—I have so far abstained from attempting to publish any notice of the above book in the papers, because for some time past their columns have been crowded with more interesting matter, and also because I waited to see if any one else took up the subjects I desired to touch upon.

I now adventure to hope that you may kindly grant me space for a brief examination into and correction of two or three statements in this biography, with which my name and Arctic explorations are more or less connected.

At page 199, we are told that "Dease and Simpson also explored the southern shores of Wollaston and Victoria Lands."

To this I reply, that Dease and Simpson never even saw, far less explored, any part of Wollaston Land. This land was seen at a distance of from 30 to 40 miles by Dr. Richardson (late Sir John) in 1826 and named by him, and was carefully searched and surveyed by me on a sledge journey in 1851 when employed in the Government service to look for the Franklin expedition. A journey of over one thousand miles at the average rate of 24 miles a day, I myself hauling a light sledge of from 50 to 60 pounds weight nearly all the distance. Dease

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and Simpson did see and roughly explore in 1839 about 140 miles of Victoria Land, lying between longitudes 105° and 110° West. All the rest of the coast was examined closely by me in the sledge journey already mentioned, and on a very long boat voyage, during which I also examined and named the west shore of Victoria Strait up to latitude 70° 15′ N.

On the same page 199, Markham tells us that "The entire North American Coast has thus (in 1839) been delineated."

In the above line this careless, or possibly designing, author, crowds into the briefest possible space a complete misstatement of facts, perverting, if allowed to pass unchallenged, a rather important part of the history of Arctic exploration, for which he is liable to the accusation of culpable negligence; the means of putting himself right being easily within his reach at the library of the Royal Geographical Society, had he wished to inspect Simpson's narrative and chart.

Hear what Simpson says on his reaching the extreme east point of his voyage at the Castor and Pollux River (94° 14′ West Longitude) in the autumn of 1839—*page* 377: "We could hardly doubt having now arrived at that large Gulf uniformly described by the Eskimos as containing many Islands, running down southward till it approached within 40 miles of Repulse Bay. The exploration of such a Gulf to the strait of the Fury and Hecla would necessarily demand the whole time and energy of another expedition." So much for this author who writes at random! Apart from this, Simpson's conclusions—by which he made Boothia an island—were wholly in error, as I proved beyond a doubt in

1847, and again in 1854, by walking over about 70 or 80 miles of land from east to west (connecting Boothia with America) which Simpson reported as sea. Had he been able to go 4 or 5 miles east of the Castor and Pollux River, he would have distinctly seen the land extending north of Boothia. If Markham's statement had the slightest foundation in fact, what was the use of the Hudson's Bay Company's Expedition of 1846–47, the whole object of which was to unite Dease and Simpson's discoveries or those of the Ross's on Boothia, with Parry's Fury and Hecla Strait? Finding Simpson wrong, I did the latter. Then in 1854 I united Simpson's survey with that of Ross, west of Boothia. Thus nearly 800 miles of the 1,000 left unexplored in 1839—Markham's absurdities notwithstanding—were completed by me, but there still remained about 200 miles, between Bellot Strait and the Magnetic Pole on the west shore of Boothia, a blank on the charts, and these were explored by McClintock in his memorable sledge journey in 1859, just 20 years after the date fixed by the author of "Franklin's Life," as that on which the whole coast of North America had been "delineated" by Dease and Simpson.

But this is not quite all. Mr. E. G. Ravenstein, who manufactured the chart of "Arctic American progress of Discovery," which is attached to the "Franklin Life," has given the greatest and noblest of Arctic Navigators, Parry, the credit of having explored the west shore of Melville Peninsula, although neither he, nor a single member of his officers or crew, ever saw a mile of it.

How this came about is as follows: Parry entered on one of his charts (see narrative of his second Arctic

voyage, 1821–23), a simple line—not shaded—as his own surveys on the same chart are telling us that it was a tracing of the west shore of Melville Peninsula from Eskimo information. No Hydrographer or Geographer was, during a period of sixty-seven years, foolish enough to imagine, that this line indicated a survey of Parry's expedition, for not a word was said about it in his journal, where it certainly would have been the greatest thing in sledging done by this great crowd of 100 or 120 blue jackets, for, as far as I can make out, the whole lot, although aided by some splendid teams of dogs, made no single continuous sledge journey over 200 miles in length ! ! during the two springs they passed at Melville Peninsula.

On my exploration of the West Coast of this Peninsula in 1847, by a very arduous journey over ice, I found the Eskimo tracing, above referred to, over seventy miles wrong in Latitude at its southern end, and at another part a degree and a half of Longitude in error, yet it was on this incorrect tracing that Ravenstein founded a claim to deprive me of three hundred miles of my survey, to remove my name from Melville Peninsula, where it had stood unchallenged for many years, and make a gift of it to a Naval Officer of great merit, but who, as I have already said, had neither himself nor any of his people seen a mile of the coast named. Had that noble officer been now alive he would have scorned to accept such an ill-begotten and false a gift.

There is much in this Biography that is quite as much open to censure as the points I have mentioned, and I fear, have dwelt too long upon. In the interest of truth and the correctness of the history of Arctic exploration,

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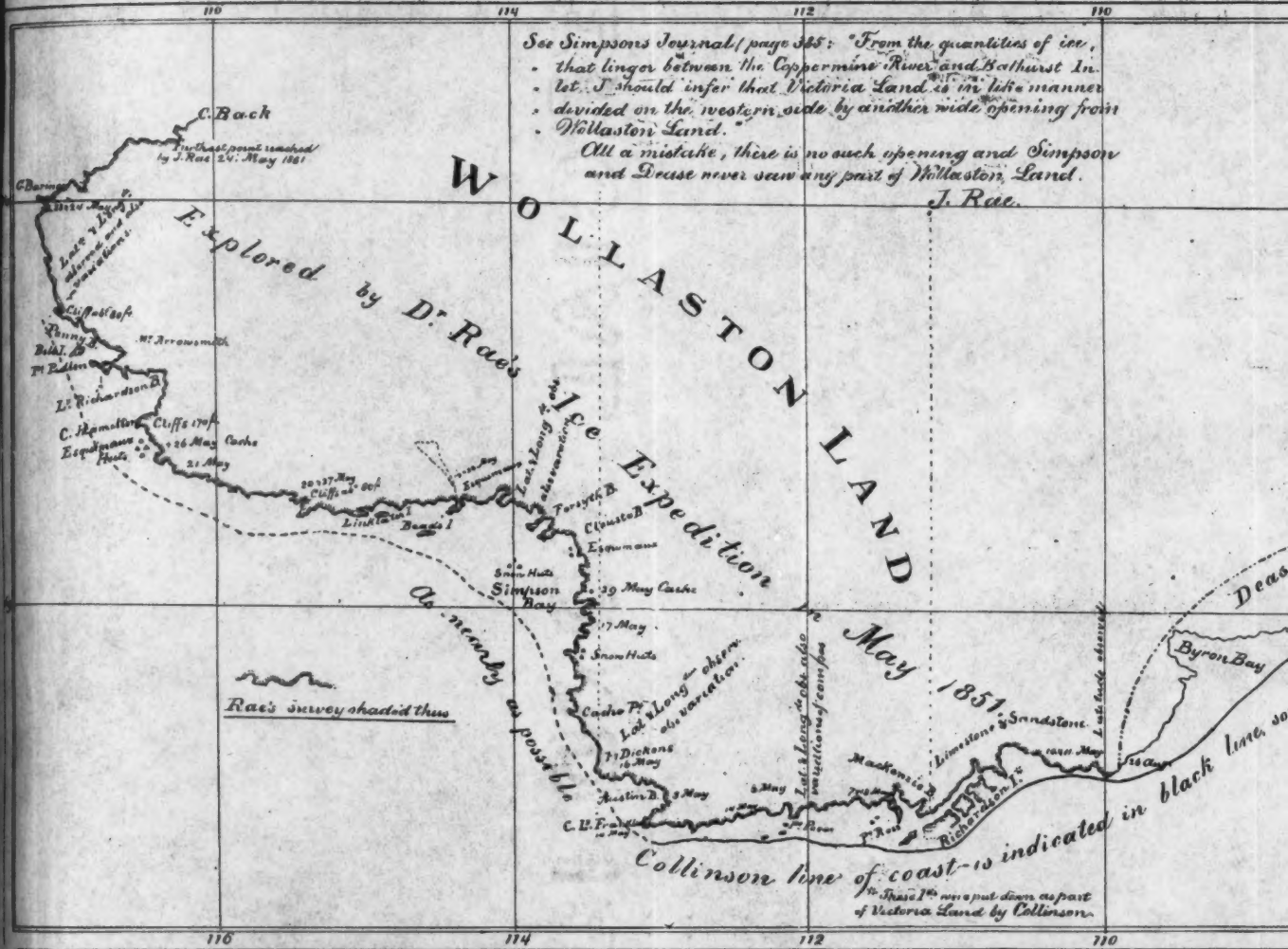
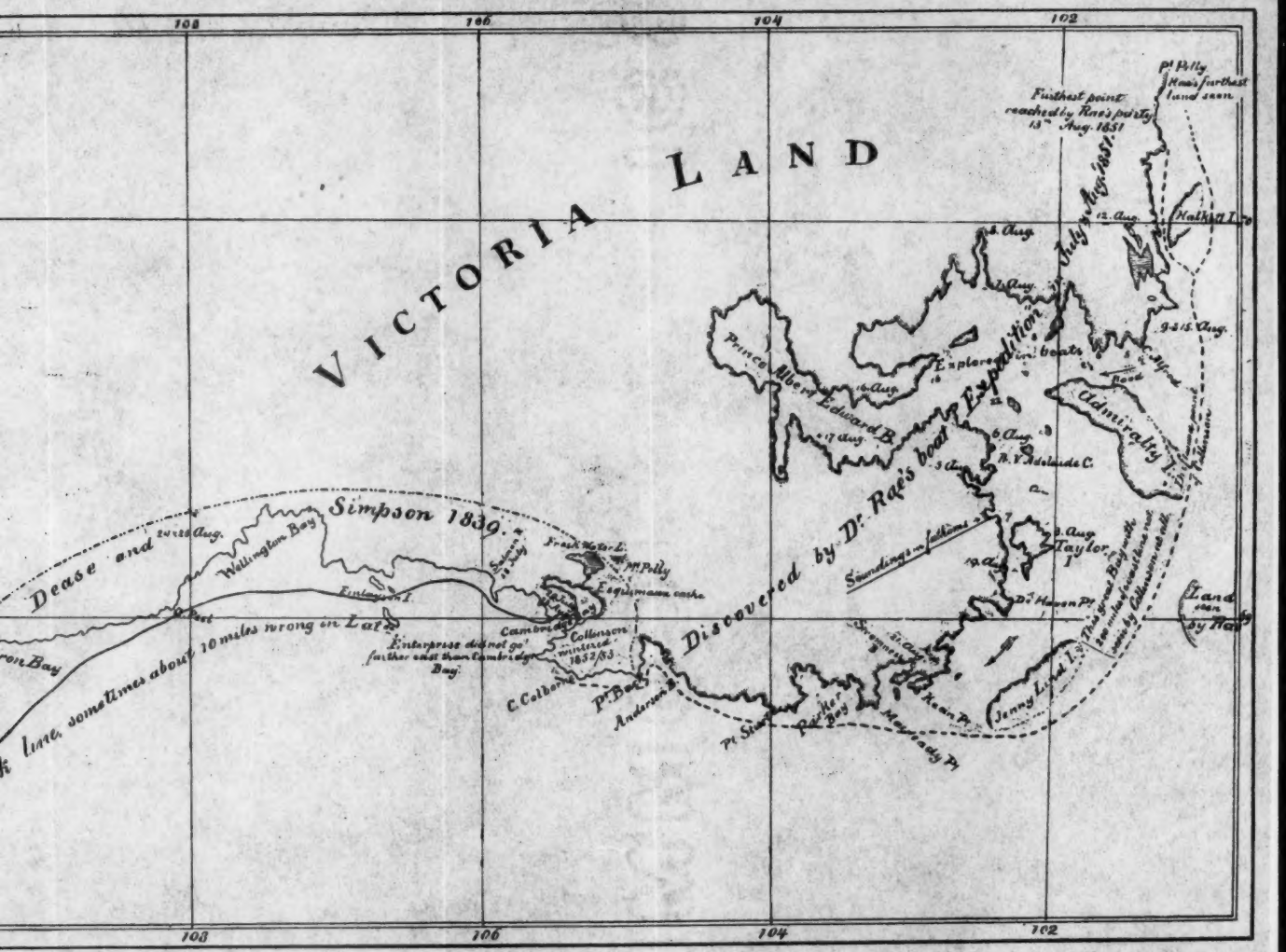

See Simpsons Journal page 385: "From the quantities of ice, that linger between the Coppermine River and Bathurst Inlet, I should infer that Victoria Land is in like manner divided on the western side by another wide opening from Wollaston Land."
All a mistake, there is no such opening and Simpson and Dease never saw any part of Wollaston Land.
J. Rae.
WOLLASTON LAND
Explored by Dr. Rae's Ice Expedition
May 1851.
C. Back
Furthest point reached by J. Rae 24th May 1851
C. Barrow
Mt. Arrowsmith
Cliffs 170 f.
Cache
Simpson Bay
Snow Huts
Rae's survey shaded thus
As nearly as possible
Byron Bay
Limestone & Sandstone
Richardson I.
Collinson line of coast is indicated in black line, so
The Straits &c are put down as part of Victoria Land by Collinson.
110
114
112
110
116
114
112
110

Map to illustrate Dr. Rae's observations on Markham's Life of Sir John Franklin.


VICTORIA LAND
Discovered by Dr. Rae's boat Expedition July & Aug. 1851.
Simpson 1839.
Dease and
Wellington Bay
Frank Hotor L.
Mt Pelly
Esquimaux cache
Enterprise I.
Camb. Bay
Collinson wintered 1852/53
Enterprise did not go further east than Cambridge Bay
C. Colborne
Pt Back
Anderson R.
Pt Stanley
Pt Her
Her Bay
Maxwell Pt
Keen Pt
Jenny Lind I.
Pt Pelly
Rae's farthest land seen
Furthest point reached by Rae's party 13th Aug. 1851
Halkett I.
Prince Albert
Prince Edward B.
Explorers in boats
Admiralty I.
R. V. Adelaide C.
Taylor I.
Dr Hanson Pt
Soundings in fathoms
Land seen by Rae
ron Bay
k line, sometimes about 10 miles wrong in Lat.
108
106
104
102

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to say nothing about a sense of common justice to myself, may I beg of you to publish this letter?

I am, sir, your obedient servant,

JOHN RAE, M. D., F. R. S.

4 Addison Gardens, Kensington,

22d June, 1891.

ANTONIO GARCIA CUBAS ON MEXICO.*

BY

GEO. C. HURLBUT.

This revised and augmented edition of the "Geographical, Statistical and Historical Picture of the Mexican United States" was prepared for the International Geographical Congress, which met in Paris in 1889. It is the result of conscientious labor on the part of the author, whose name guarantees its accuracy, and it brings together in a concise form data for which it would be vain to look elsewhere.

The work is divided into three parts. The first treats of the situation, boundaries and extent of the country, political divisions, revenues and expenditures, ethnographical divisions, climate, hydrography, physical aspect, etc. The second describes the population, roads, railroads, telegraphs, ports and lighthouses, public instruction, libraries, agriculture, mines, industries, etc.

The third part reviews the history of Mexico, the archæology, the immigration and ancient history, the conquest and the Spanish domination, and the seventy years of independence.

The republic lies between 14° 30′ and 32° 42′ N. Lat.,

* Etude Géographique, Statistique, Descriptive et Historique des Etats Unis Mexicains, par Antoine Garcia Cubas, Auteur de diverses œuvres scientifiques et litteraires, Chevalier de la Légion d'Honneur.—Ouvrage publié par ordre du Ministère des Travaux Publics. Mexico, 1889.

and 86° 46′ 8″ and 117° 7′ 8″ W. Long. (Meridian of Greenwich); and it has an area of 1,946,292 sq. kilometres (751,495 sq. miles).

The confederation comprises 27 States, 2 Territories (Baja California and Tepic), and the Federal District,* with a total population of 11,395,712.† Half or nearly half of the total number is concentrated in the 12 middle States and the Federal District (5,481,959); next to these come the 7 States on the Pacific, with 3,693,488, then the 5 States on the Gulf, with 1,310,941, and last of all the 4 frontier States and the 2 Territories, with 909,324.

The urban population is nearly 2,100,000, or less than a fifth part of the whole. The largest city is the capital, Mexico, which has 350,000 inhabitants. Next in order are Guadalajara with 105,000, Puebla with 100,000, Guanajuato with 73,531, León and Mérida with 50,000 each. The other cities and towns have populations ranging between 6,000 and 45,000.

The Federal revenue, which amounted in 1880 to $21,936,156, increased in 1888 to $32,126,509; and the aggregate revenue of the States, which showed in 1880 a total of $7,011,962, attained in 1888 a total of $11,203,761.

The expenditures were: Federal, and State, in 1880, $27,257,481; in 1888, $42,747,518.

The value of real estate was, in 1888: City property, $252,086,126; other real estate, $221,433,745; making

* The Federal District is composed of the Municipality of Mexico, and the Cantons, or Sub-Districts of Tacubaya, Tlálpan, Xochimilco and Guadalupe Hidalgo.

† The returns for the year 1880, give a total population of 9,908,011, but Mr. Cubas is inclined to think that this calculation falls below the truth.

a total of $473,519,871.* On this subject Mr. Cubas remarks: "These figures are far from the truth, and have no importance beyond their application as a basis for the payment of taxes, according to the *minimum*, declared by the owners. The public buildings, civil and religious, are not included in these valuations."

Ethnographically, the population is divided into three groups; the European and Spanish American numbering 2,165,185, the Mestizoes numbering 4,900,156, and the Native Race 4,330,371 in number. The progressive element in the country and the one entirely in sympathy with European civilization is represented by the first group, and a large portion of the second, the two together constituting the larger part of the nation. This element supplies the professors of the liberal arts and sciences, the scholars, the engineers and architects, the writers and the printers, and the capitalists, and nearly all the artisans of the country. There are many well-organized workingmen's associations, possessing each its library, and supporting its own free school.

There is a sharp contrast between the individuals of the native race, who live in the neighborhood of the great centres, and those who inhabit the remoter and mountainous parts. The former are dull and indolent; the latter, who preserve their native tradition and their languages, are active cultivators of the soil.

The general characteristics of the indigenous race are mistrust, dissimulation, craftiness and obstinacy;

* The actual value is about seven times as great. The *Statesman's Year Book*, for 1889, says: "The real property of Mexico, exclusive of mines, ports, rivers, and other public property, has been valued at 3,549,060,000 dollars in 1883."

qualities modified in many instances by civilization, but whether for the better or for the worse, Mr. Cubas does not say.

Some tribes, such as the Comanches and the Apaches, who make their incursions from the American territory, are pure savages. Besides agriculture, which is their principal occupation, the native Indians employ themselves in making cotton stuffs, basket-work, pottery, hats, and butter and cheese. Those who live in the remoter parts are always decently clad and cleanly in their persons. Converted to Christianity by the Conquest, these people have maintained in many places the practice of their ancient ceremonies, and on certain solemn occasions they perform their religious dances in the churches before the most venerated images, such, for instance, as that of the Virgin of Guadalupe.

The Indian, though inclined to excess in the use of strong drink, is brave, generally sober, and of great endurance. Many of the race live in sound health to a great old age. Those among them who have had the advantages of education have abundantly proved the adaptability of the race to a high civilization. The decrease and gradual disappearance of the race in certain parts of the country are due to various causes, such as epidemics, the wars through which the country has passed, and the mingling with the whites and the mestizoes. The Indian population is most numerous in the Southern States: Michoacan, Guerrero, Mexico, Hidalgo, Morelos, Puebla, Veracruz, Oaxaca, Chiapas, Tabasco, Campeche, and Yucatan.

The philologist Pimentel enumerates 14 ethnographic families, classified by their languages. The largest is

the Mexican family, numbering 1,849,766 persons; then follow the Othomí. with 794,734, the Mixteca-Zapoteca, with 677,088, the Maya-Quiché, with 456,283, and the Tarasca, with 275,000 representatives. No other family counts 100,000 individuals, and two, the Huave and the Guaicura, have each less than five thousand. The smallest family, the Séri, inhabits the Isla del Tiburon, in the Gulf of California. "Their number," says Mr. Cubas, "has very happily suffered a sensible reduction and now amounts to barely two hundred." A reference to the account given of this tribe by Orozco y Berra excuses the feeling of satisfaction with which Mr. Cubas looks to its approaching extinction: "The Séris are the smallest of the Sonoran tribes, but also the most cruel and the most deceitful, and the one least inclined to submit to an orderly life. . . . Lazy and indolent, they abandon themselves so completely to drunkenness that the mothers give the liquor from their own mouths to the smallest children." *

There are 96 cotton factories, large and small, in the Republic, consuming annually 57,200,000 pounds of cotton (28,600,000 of foreign growth), and producing 3,800,000 pieces of domestics, 280,000 pieces of calico, and 2,735,000 of cotton yarn. More than 50,000 families are supported by this branch of industry.

There are 16 woollen factories engaged in the production of cloths, carpets and yarn; and seven paper-mills,

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* Los Séris . . . son la nacion mas pequeña de Sonora, mas tambien la mas cruel, la mas falaz, la que menos ha querido reducirse á vida politica . . . . . perezosos, indolentes, se entregan con tanta pasion á la embriaguez, que las madres dan con la boca el aguardiente á los niños mas pequeños.—*Geografía de las Lenguas y Carta Etnográfica de Mexico, pp. 353-354, Mexico, 1864.*

which supply the demands of the printing establishments.*

The organization of the Roman Catholic Church in Mexico embraces 326 prelates, with 8,763 churches and chapels and 11,337,000 parishioners.

There are 88 Protestant churches, distributed as follows: in the Federal District 21, Michoacan and Puebla, each, 13, Morelos 10, Mexico 5, Guanajuato 4, Hidalgo, Veracruz and Tamaulipas, each, 3, Querétaro, Jalisco, Tabasco and Zacatecas, each, 2, Guerrero, Tlaxcala, Aguascalientes, Nuevo Leon and Tepic, each, 1.

The railroad from Vera Cruz to the City of Mexico, formally opened on the 1st of January, 1873, after thirty years of efforts and delays and interruptions, had been in operation but four years when the great railroad movement began, which is still in progress. In 1880, there were 15 lines finished and at work; in 1888, there were 47 lines. In 1880, there were 1,055 kilometres (656 miles) of railroad in the country; in 1888, there were 7,506 kilometres (4,664 miles), of which 4,688 kilometres (2,913 miles) were broad-gauge and 2,818 kilometres (1,751 miles) narrow-gauge roads. There were, also, 351 kilometres (218 miles) of horse-railroad in the various cities and suburbs.†

The longest roads are: the Central (broad), from

* According to information received at the Bureau of the American Republics, Washington, D. C., early in August, the first linen mill established in Mexico had been formally opened, not long before, on a site near the City of Mexico. The establishment is to cover a space of 42,000 square feet.

† According to the *Almanach de Gotha, 1891*, the collective length of railway lines was, on the 30th of June, 1890, 8,948 kilometres (5,560 miles), and that of the horse-railroads 416 kilometres (258 miles).

Mexico to Paso del Norte, 1,971 kilometres (1,225 miles); the Nacional Mexicano (narrow), from Mexico to Nuevo Laredo, 1,348 kilometres (838 miles); the Internacional Mexicano (broad), from Piedras Negras to El Torreon, 616 kilometres (383 miles); the Mexicano (broad), from Mexico to Vera Cruz, 424 kilometres (263 miles), and the Sonora (broad), from Guaymas to Nogales, 422 kilometres (262 miles).

It was in 1850 that Don Juan de la Granja sent the first message over a telegraphic line of 1,000 metres in length (0.62 mile), connecting the Palacio Nacional with the Minería. In 1880, the length of the telegraphic lines had increased to 16,910 kilometres (10,501 miles), and in 1888, to 44,395 kilometres (27,586 miles).*

In 1880 there passed through the Mexican Post Office 5,788,182 domestic, and 1,366,608 foreign letters and papers, yielding a revenue of $605,652. In 1888 the amount of the correspondence was: Domestic letters and papers, 27,390,288, and Foreign, 1,627,538; Revenue, $805,436.†

The ports open to foreign commerce are, on the Gulf of Mexico: Matamoros, Tampico,‡ Túxpam,

* The *Almanach de Gotha, 1891*, makes the total length 47,505 kilometres (29,519 miles).

† The *Almanach de Gotha, 1891*, makes the figures for the year 1889: Domestic Letters and Postal Cards, 87,509,640; Foreign, 37,193,403; Receipts, $976,571; Expenses, $1,039,818. Palpable as they are, the errors in this statement defy correction.

‡ The Bureau of the American Republics, Washington, D. C., reports, August 11, 1891, that the jetties of the new harbor at Tampico are advancing to completion. The north jetty has a length of 5,835 feet, the south jetty one of 5,340 feet, and it is expected that by October of this year both will have been extended to 7,000 feet, with a depth of water of 34 feet at the heads.

Veracruz, Coatzacoalcos, Frontera, Isla del Carmen, Campeche, Progreso; on the Pacific: Guaymas, Altata, Mazatlan, San Blas, Manzanillo, Acapulco, Puerto Angel, Salina Cruz, Tonalá, Soconusco, La Paz, Santa Rosalia, Cabo San Lúcas, La Magdalena and Todos Santos.

Mr. Cubas gives a detailed classification of the imports and the exports for the first six months of the fiscal year 1885–1886. The value of the imports was $23,353,219, in which amount were included Cotton to the value of $7,361,493, Wool to the value of $1,728,-172, Provisions to the value of $2,744,873, and Machinery $1,050,642. The imports from the United States amounted to $10,353,824, those from England to $5,219,638, from France, $3,903,758, from Germany, $2,168,970. Nearly half the total amount ($11,213,100) entered through the port of Veracruz. The duties paid on these $23,353,219 were $8,552,246.

The exports for the same period (six months of the fiscal year 1885–1886) were $20,229,785, of which amount $12,373,683 went to the United States, $5,588,-172 to England, $1,293,147 to France and $702,437 to Germany.

The precious metals held the first place among the exports, with a total value of $14,734,722, subdivided as follows: Mexican silver coin, $11,198,201; Foreign silver coin, $27,819; silver bars, $2,349,628; mixed silver and gold, $61,131; sulphurets, $24,508; silver ore, $776,907; scrap-metal, $3,190; argentiferous lead, $2,680; Mexican gold coin, $137,485; foreign gold coin, $21,263; gold bars, $131,910.

After the precious metals came Henequen (Sisal-

hemp), $1,403,839; hides, $764,560; timber, $623,909; coffee, $553,635; vanilla, $282,812; Ixtle (fibre, like the henequen), $272,633; live stock, $265,768; lead, $240,790; tobacco, $192,269.

Of the total exports, $7,507,286 passed through Veracruz; $5,624,745 through Paso del Norte, $1,692,275 through Mazatlan, and $1,532,264 through Progreso.*

The arrivals and departures of vessels were in 1887: *Arrivals*, Foreign Ports, steamers, 653; sailing vessels, 587; Domestic Ports, steamers, 1,680; sailing vessels, 4,897; *Departures*, Foreign Ports, steamers, 642: sailing vessels, 562; Domestic Ports, steamers, 1,710; sailing vessels, 4,937.

The total tonnage was: Steam vessels entered, 1,558,232; sailing vessels entered, 319,043; steam vessels cleared, 1,573,161; sailing vessels cleared, 316,784.

Nearly all the Mexican States have adopted the principle of obligatory and gratuitous primary education, with penalties for the parents or guardians, who seek to avoid the obligation. The branches taught are: Reading, Writing, Spanish Grammar, Arithmetic (and the Decimal System), Geography, Compendium of Universal History, the History of Mexico, and Manners. To these is added, in the schools for girls, the use of the needle.

Nearly all the primary schools are maintained by the municipalities, but the Government supports, or makes appropriations for, a considerable number of them.

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* The imports and exports for the fiscal year 1888–1889 were, according to the *Almanach de Gotha, 1891*:

Imports, $38,658,333.

Exports: Merchandise, $21,373,148. Precious Metals, $38,785,275. } $60,158,423.

Besides the public schools, there are many originally private establishments, which are now under the supervision of various societies.

According to an Official Report, there were in 1881 8,536 Primary Public Schools (6,441 for boys, and 2,095 for girls) with 435,953 scholars (324,006 boys, 111,947 girls). In 1889, the figures were : 10,726 schools (8,027 for boys, 2,699 for girls) with a total of 543,977 scholars (393,142 boys, 150,835 girls).

In the Secondary schools instruction is given in : Arithmetic, Algebra, Geometry, Cosmography, General Geography, Universal History, the Geography and the History of Mexico, Book-keeping, Grammar, Foreign Languages, Drawing and Music.

The higher education, which is preparatory to the professional schools, embraces : Mathematics, Geography, Cosmography, Comparative Geography, Physics, Chemistry, Natural History, Logic, Ethics, Literature, Chronology and General History, the History of Philosophy, Stenography, Telegraphy, Latin, Greek, Spanish, French, English, German and Italian, Drawing and Music. In some establishments there are added the native languages, such as the Mexican and the Othomí.

These professional schools, all fully equipped with apparatus, collections and libraries, are : the Law Schools 19, the Schools of Medicine 9, Engineering (8 Colleges and 1 Mining College), Fine Arts 4, Agricultural 2, Commercial 2, Mechanics 7, the Conservatories of Music 3, the Schools for the Blind, and for the Deaf and Dumb, and the Military School (with 2 Naval Colleges).

In the Secondary schools for girls the branches taught are: Mathematics, Physics and the Elements of Chemistry, Spanish, Cosmography, Geography, History and Chronology, Comparative Geography, the History and Geography of Mexico, Writing, Bookkeeping, Domestic Economy, Domestic Medicine and Hygiene, Ornamental Drawing and Drawing from Nature, French, English and Italian, Needle Work, Pedagogy, Music, Singing, Horticulture, and the Elements of Natural History.

There are 16 of these Secondary schools for girls; and numerous Normal schools for the instruction of teachers.

The number of pupils in the Secondary and the Higher Preparatory schools is 21,000 (2,500 girls, 18,500 boys).

The expenditure for public instruction was, in 1888:

Appropriations by the Federal Government	$802,000
" in the Federal District.....	210,000
" by the States and the Municipalities.	2,500,000
	$3,512,000

The public libraries are: In the City of Mexico (omitting those of the special Colleges and Schools), the Nacional, 150,000 volumes, the library of the Cinco de Mayo, 9,000, that of the Museo Nacional, 3,000, that of the Sociedad Mexicana de Geografia y Estadística, 4,000 volumes; and 12 others (of which the largest has 25,000 volumes) in 12 cities, mostly of the Middle States.

The newspapers and periodicals published numbered, in 1888, 120 in the City of Mexico, and 267 in the rest of the country.

Mexico possesses three Meteorological and Astronomical Observatories ; one, the Central, in the Palacio Nacional at Mexico, one at Tacubaya, and, one at Mazatlan.

Mexico is a country of table-lands, rising from the coasts in a series of terraces to the great central plateau which attains its highest level, 8,465 feet, at Toluca. Two mountain ranges, the Sierra Madre Oriental on the east, and the Sierra Madre Occidental on the west, extend from Oaxaca, where they divide, in a northwesterly direction across the territory of the United States and British Columbia, and terminate in Alaska.

The plateaux, enclosed between these two ranges and many subsidiary chains, are nearly all at a great elevation above the sea. Mr. Cubas has brought together in the following list, to show the relief of the surface, a nnmber of elevations of plateaux and valleys :

	Metres.		Feet.
Plateau of Toluca	2,580	=	8,465
Valley of Ixtlahuaca (Mexico)	2,527	"	8,291
" of Mexico	2,270	"	7,448
Plains of Apam (Tlaxcala)	2,480	"	8.137
Plain of Puebla	2,000 to 2,150 metres	=	6,562 to 7,054 feet
	Metres.		Feet.
San Juan de los Llanos (Puebla)	2,360	=	7,743
Valley of Maltrata (Veracruz)	1,691	"	5,548
" Orizaba "	1,227	"	4,026
" Oaxaca "	1,550	"	5,085
Cuernavaca (Morelos)	1,525	"	5,003
Plains of San Gabriel (Morelos)	1,008	"	3,307
Taxco de Alarcon (Guerrero)	1,780	"	5,840
Iguala "	919	"	3,015
Mescala (Rio de las Balsas)*	520	"	1,706

* This river has its origin in the melting snows of Ixtaccihuatl. It is known in the upper part of its course as the Atoyac, and it reaches the Pacific after winding through several States for 500 miles.

For the last 200 miles its descent to the sea is by a succession of 226 rapids, so-

	Metres		Feet.
Zitácuaro (Michoacan)	2,000	=	6,562
Chilpancingo (Guerrero)	1,420	"	4,659
Morelia (Michoacan)	1,950	"	6,398
Pátzcuaro "	2,190	"	7,185
Ario "	1,890	"	6,200
Jorullo "	850	"	2,789
Las Balsas (Rio de las Balsas)	123	"	404
Tula (Hidalgo)	2,047	"	6,716
Tulancingo (Hidalgo)	2,089	"	6,854
Llanos de Cazadero (Hidalgo)	2,300	"	7,546
San Juan del Rio (Querétaro)	1,950	"	6,398
Bajío (Guanajuato)	1,750 to 1,790 metres = 5,742 to 5,873 feet		

	Metres.		Feet.
Guadalajara (Jalisco)	1,523	"	4,997
Valley of Ameca "	1,180	"	3,871
Tepic "	900	"	2,953
Acaponeta "	64	"	210
Sayula "	1,386	"	4,544
Zapotlan "	1,495	"	4,905
Atenquique "	1,248	"	4,095
Colima (Colima)	532	"	1,745
Plains of El Salado (San Luis),	2,000 to 2,300 metres=6,562 to 7,546 feet		

	Metres.		Feet.
Valle del Maíz "	1,220	"	4,003
Tula (Tamaulipas)	1,171	"	3,842
Ciudad Victoria (Tamaulipas)	449	"	1,473
Monterey (Nuevo Leon)	486	"	1,595
Cerralvo "	380	"	1,247
Cuencamé (Durango)	1,740	"	5,709
Vegas de Nazas "	1,100	"	3,609

The predominating rocks belong to the granitic, porphyritic, basaltic and calcareous groups.

The porphyritic rocks are colossal masses on the mountain tops, such as the Cofre de Perote, the Órganos de Actopan, the Pico de Bernal; or they are found in vast beds, and in this state they are rich in metalliferous veins.

that, as one writer expresses himself, it is rather to be called a staircase than a river. The mean inclination of its bed, in this part of its course, is 3 feet 8 inches to the mile.

The basalts are met with in the form of lava, as on the sides of the Volcan de Ajusco and on the eastern slope of the Cofre de Perote ; or in compact masses and in regular columns. In this latter condition they enclose narrow valleys, such as those of Santa Maria de Regla and the Barranca Grande, in Hidalgo.

The granites and the syenites enter into the structure of some of the mountain chains.

Other chains are of calcareous formation, and this also predominates in the valleys.

What is known as the Volcanic Zone stretches across the country from East to West in a belt nearly 600 miles long and 60 miles in width. A line drawn from the volcano of Colima, in the neighborhood of the Pacific, to the volcano of San Andrés Tuxtla, near the Gulf of Mexico, passes through the middle of this zone. The principal volcanoes are: San Andrés de Tajimaroa, in Michoacan, the Nevado de Toluca, in the State of Mexico, Ajusco, the Sierra de San Nicolas and the Caldera, in the Federal District. Most of these are extinct. The active volcanoes are: Colima and San Andrés Tuxtla, Jorullo, Popocatepetl, and Orizaba.

The evidences of past volcanic action abound, moreover, throughout the territory of the Republic.

The measurements of 22 of the principal mountains are given by Mr. Cubas, as they stood on the record before Professor Heilprin's recent expedition. Considering the uncertainty as to the results of that expedition, it must be said that the mountains keep the relative rank assigned to them by Mr. Cubas. The names of the peaks are given, with the State or District to which they belong.

	Heights are above the sea. Mètres.	Feet.
Popocatepetl (Mexico and Puebla)	5,425 =	17,798
Citlaltepetl, or Peak of Orizaba (Veracruz)	5,295 "	17,372
Ixtaccihuatl (Mexico and Puebla)	4,900 "	16,076
Xinantecatl, or Nevado de Toluca (Mexico)	4,578 "	15,019
Nauchampatepetl, or Cofre de Perote (Veracruz)	4,089 "	13,415
Matlalcueyatl, or Malintzi (Tlaxcala)	4,107 "	13,474
Ajusco (Federal District)	4,153 "	13,625
Zempoaltepetl (Oaxaca)	3,396 "	11,142
Pico de Quinceo (Michoacan)	3,324 "	10,906
Nevado de Colima (Jalisco)	4,378 "	14,363
Volcan de Colima (")	3,884 "	12,743
Volcan de Ceboraco (")	1,525 "	5,003
Pico de Tancítaro (Michoacan)	3,860 "	12,694
Monte Patamban (")	3,750 "	12,304
Veta Grande (Zacatecas)	2,786 "	9,141
Jesus María (Chihuahua)	2,511 "	8,238
Monte Proaño (Zacatecas)	2,368 "	7,769
Las Navajas (Hidalgo)	3,212 "	10,538
El Gigante (Guanajuato)	3,250 "	10,663
Llanitos (")	3,815 "	12,517
El Volcan de Jorullo (Michoacan)	1,300 "	4,265
El Volcan de Tuxtla (Veracruz)	1,500 "	4,921

Owing to the configuration of the country, with its high table-lands and mountain chains, the Mexican river systems are of no great importance. The principal basins are: that of the Rio Bravo (Rio Grande); that of the Mescala or Rio de las Balsas; that of the Panuco; that of the Lerma or Santiago; those of the Grijalva and the Usumacinta; and that of the Papaloapan. Of all these and the many smaller basins it may be said that they are practically useless for navigation. It is not to the rivers, but to the railways, and especially to the shorter and subsidiary lines, that the Mexicans must look for the means of developing the great resources of their territory.

The lakes may be divided into five groups. The

first comprehends the lakes that have neither inlet nor outlet, and are supplied by the rain fall; such as Lakes Xaltocan and San Cristóbal, in the Valley of Mexico, and, in Jalisco, Lake Magdalena, which had its origin in a destructive water-spout.

The second consists of the lakes formed by the expansion of rivers. An example is Lake Xochimilco in the Valley of Mexico. Into this descends from the mountainous region of Ajusco the Buenaventura River, which feeds the La Viga canal and through it communicates with Lake Texcoco.

The third is the group of lakes, which have no inlet and yet give rise to rivers. Zipimeo, in Michoacan, and Yuririapúndaro, in Guanajuato, belong to this class.

Lakes which receive and absorb the streams that flow into them belong to the fourth group. The Valley of Mexico has lakes of this character*: Texcoco, which receives two small rivers on the western, and several on the eastern side; and Chalco, into which flow the Tlalmanalco and Tenango.

The fifth is the group of lagoons that communicate with the sea, like the Laguna de Términos, in Campeche.

The coast line of Mexico is very extensive, and measures on the Atlantic side 1,600 miles, of which more than 800 belong to the peninsula of Yucatan. On the Pacific the line is not far from 4,000 miles in length, the two coasts of Baja California alone measuring 1,880 miles.

* San Cristóbal, which properly belongs to this class and is so entered by Mr. Cubas, appears also, by an oversight, in the first class.

It is not an easy matter to describe the climate and the productions of a region so extensive as the Mexican Republic.

Mr. Cubas says of the climate: "The northern portion of the Mexican territory lies within the temperate, the southern portion within the torrid zone. These two great divisions, combined with the varying elevations, determine the general distribution of temperature and the diversity of the climates. The most general division is the one that recognizes three regions: those of the hot land (tierra caliente), the temperate land (tierra templada), and the cold land (tierra fria). It is none the less difficult to mark the precise limits of each, since these vary with the elevation and pass by insensible degrees into one another, and the vegetation changes in the same way.

"The torrid zone and its tropical vegetation reach from the sea-level to the height of 1,000 metres (3,281 feet). The mean temperature, in summer, is from 30° to 31° Centigrade (86° to 88° Fahr.). The land in this zone and in the neighborhood of the sea is extremely fertile, thanks to the abundant humidity, which is maintained by constant dews and the copious summer rains; but the climate is not healthy. The north-east and south-west winds, which prevail on the Pacific Coast, and the violent north winds, which blow in tempests on the Gulf coasts from October to March, modify the temperature, and the mercury descends to 22° Centigrade (72° Fahr.). The parts of this zone which are not swept by the north wind, and which are situated in the vicinity of swampy lands, are unhealthy to the highest degree.

"A perpetual spring reigns on the slopes of the Cordilleras, between the altitudes of 1,000 metres (3,281 feet) and 1,600 metres (5,249 feet), the thermometrical changes never exceeding 4 or 5 degrees Centigrade (7° to 9° Fahr.) and the mean temperature varying from 23° to 25° Centigrade (73° to 77° Fahr).

"The two extremes of heat and cold are entirely unknown. Jalapa, Huatusco, in Veracruz, Chilpancingo and Tasco, in Guerrero, Ameca, in Jalisco, and many other places that might be named, are renowned for their perfect salubrity and soft climate Unfortunately, the clouds, driven before the winds and caught by the mountains, frequently cover all these places with thick fogs. The European may settle anywhere in this region and become acclimated, with perfect security against the endemic diseases that prevail in the torrid zone; and the working man, whether artisan or farmer, has the prospect of acquiring a competence.

"The third zone includes all the country above the elevation of 1,600 metres (5,249 feet) and embraces a great part of the central plateau, the mean annual temperature of which varies between 15° and 17° Centigrade (59° and 63° Fahr.), with the exception of certain great depressions and deep, enclosed valleys, in which the temperature and the vegetation belong to the temperate zone.

"It is often remarked that a few hours' travel suffices to make a total change in the climate and the productions of the land. During the winter the mercury frequently sinks, on the lofty plateaux of Toluca and Mexico, below 0° Centigrade (32° Fahr.), and frosts are not uncommon; but in general the winter is mild, and the mean

temperature is from 13° to 14° Centigrade (55° to 57° Fahr.)."

The hot lands, on the Gulf Coast, are all Yucatan, the State of Tabasco, the greater part of Veracruz, and the portion of Tamaulipas near the sea. On the Pacific they include the whole of Baja California, and, with some exceptions, the coasts of Sonora, Sinaloa, Jalisco, Michoacan and Guerrero, and the State of Colima.

The cold lands may be said, in a rough way, to lie between the eastern and the western ranges of the Sierra Madre; and the temperate lands occupy the mountain slopes between the other two zones of climate.

There are but two seasons, the wet and the dry, in the torrid zone, and the changes are less sensibly felt than in the temperate or the cold regions. The wet season begins in June, the precipitation increasing up to the time of the autumnal equinox, and ceasing early in November. In this season the mornings are generally fine, but as the day advances the clouds gather and the rain descends, accompanied by thunder and lightning, frequently also by hail-storms and water-spouts; and then the atmosphere becomes limpid, and the sky pure and clear.

The climate and the soil of Mexico are adapted to the cultivation of every known plant, and it is not to be doubted that with the regular extension of the well-planned railway system the agricultural development of the country must take on steadily increasing proportions.

The annual value of certain products is stated as follows:

Cotton,	$10,857,000	Sugar,	$8,735,000
Rice,	1,246,000	Maize,	110,000,000
Indigo,	372,910	Beans and pease,	9,550,000
Cacao,	1,135,360	Aniseed,	105,000
Coffee,	3,200,000	Barley,	4,500,000
Tobacco,	2,500,000	Wheat,	18,400,000
Cochineal,	111,910	Sesame,	200,000
Vanilla,	900,000	Chile (pepper)	455,000
Sarsaparilla,	200,000	Potatoes,	600,000
Henequen, (aloe fibre)	3,718,750		
Ixtle, (aloe fibre)	700,000		
			$177,486,930

These figures are only approximate, for, as Mr. Cubas remarks, the Statistical Department of the Mexican Administration was still in its infancy in 1889.

For the encouragement of immigration a Colonization law has been passed, by authority of which the Government concedes certain advantages to settlers. A fixed proportion of land is sold to each settler at a low price and on a long credit, to be redeemed by yearly payments, beginning with the second year; the colonist is exempted from military service, and, for ten years, from the payment of any tax other than that of the commune; his tools, his furniture, his agricultural implements, building materials and cattle pay no tax whatever, and he has the privilege (which cannot be transferred) of exporting his products free of duty; and special premiums are awarded for the introduction of a new culture or a new industry.

Mr. Cubas enumerates 21 colonies, mostly of Europeans, established under these general conditions in various parts of the country. There are in all 7,000 colonists, the largest single settlement being that of 2,294 Mexicans from the United States, now permanently established at Ascension, in the State of Chihuahua.

The experience of other countries shows that immigration is by no means an unmixed benefit, and the Mexicans will have little cause for regret if many years pass away before the great human tide turns to their shores.

The mineral wealth of Mexico is not confined to gold and silver, but includes nearly every metal, the rarest as well as the most common, besides salt, sulphur, building stones, coal, marble, jasper, granite, porphyry, etc.

The metalliferous belt extends from the State of Sonora to the State of Oaxaca, a distance of 1,200 miles. The western chain of the Sierra Madre is richer than the eastern, but it may be said of both that their resources are practically without end. Silver and gold have been mined since the Conquest.

The history of coinage in Mexico begins with the establishment of the Mint by the royal order of May 11, 1535. The building was at first called the *Fundicion*, and hither were brought the gold and the silver, to be stamped and marked with the fineness of each piece and its intrinsic value. In 1562 the Mint was transferred to the Palacio, which the Government had acquired by purchase from the family of Cortés, and there remained until the year 1844, when it was removed to its present position adjoining the Museo Nacional. Under the Spanish domination the Casa de Moneda, in the City of Mexico, was the only mint in the colony, and its records present the sum total of the Mexican coinage for nearly 300 years. During the few years immediately succeeding the Conquest and before the Mint went into operation, gold and silver circulated in

bars, stamped by the officers of the Crown. The coinage began in 1537, and the issues of the Mint, from that year to 1821, are divided into three classes, distinguished by the style of the coins. From 1537 to 1731, the pieces, known as *macuquinas*, were of irregular and unequal shape, struck by hand, and bearing on one side a cross, two castles and two lions, and on the other the cipher which indicated the name of the reigning monarch. From 1732 to 1771, the pieces were the Pillar dollars, circular in form, stamped with the arms of Spain between the Pillars of Hercules, and bearing the famous legend, *Plus Ultra*. From 1772 to 1821, the coins bore on one side the head of the king, and were known by the name of the Bust money. Within the last 40 years the Mint has been reorganized and refitted from time to time with improved machinery, imported from England, France and the United States. The total coinage during the Colonial Period was, in dollars:

		Gold.	Silver.	Total.
Macuquina	1537–1731	8,497,950	752,067,456	760,565,406
Pillar	1732–1771	19,889,014	441,629,211	461,518,225
Bust	1772–1821	40,329,866	858,517,634	898,847,500
		68,716,830	2,052,214,301	2,120,931,131

Since the Independence, the Mint in the City of Mexico has coined: Gold, 15,694,251; silver, 237,703,199, and copper, 328,796 dollars, so that the product of the Mint, from its foundation in 1537 to 1888, was 2,374,328,581 dollars. Fourteen other mints (now reduced to eleven), established at various points between the years 1810 and 1868, have coined collectively 943,847,240 dollars; and the total coinage of Mexico, from

the beginning to the year 1888, amounts to 3,318,175,-821 dollars. Mr. Cubas supplements his account of the mineral resources with an alphabetical list, including more than 1,000 names of mines, and mining properties, whether in operation, or temporarily in suspense.* Silver mines are the most numerous; next come, in order, gold, copper, lead, iron, cinnabar, coal, petroleum, etc.

An interesting chapter on the Valley of Mexico is followed by an admirable summary of Mexican history; and the work closes with a description of the reorganized army, and the infant navy of the country. The army is divided into the Active service, the Reserve, and the General Reserve; and the total force on a war footing amounts to 160,963, composed of 131,523 infantry, 3,650 artillery, and 25,790 cavalry.

* The *Statesman's Year-Book*, for 1889, puts the number of mining enterp ises at 324, employing 102,240 men.

THE COLORADO DESERT AND ITS RECENT FLOODING.

BY

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This article will give:

I. A BRIEF DESCRIPTION OF THE COLORADO DESERT.
II. AN ACCOUNT OF ITS RECENT FLOODING.
III. THE PROBABLE RESULTS.

I.

The Colorado desert lies between the 32° and 34° parallels of north latitude, and 38° and 40° longitude West from Washington.* Its larger portion is in the extreme south-eastern end of California, in San Diego County, and a smaller portion is in the north-eastern end of Lower California.

Its general shape is that of a triangle, with the apex to the north-west. The Sierra Madre, with an average altitude of 6,000 feet above the sea-level, forms its western side. Its eastern side is a spur of the Sierra Madre, which runs south-easterly about 180 miles to the Colorado River, at an average altitude of 4,000 feet. The desert valley opens south-easterly towards the Gulf of California. Its total area is nearly 6,000 square miles, of which 3,900 square miles is below sea-level, ranging from various depths to 360 feet, but averaging from 150 to 250 feet.

* 115° and 117° W. from Greenwich, as on the map.

The surface, excepting this great depression, has a general slope towards the Gulf.

Fifteen miles west of the town of Yuma, at the junction of the Gila (pronounced *Hee'-lah)* and Colorado rivers, are the Cargo Muchacho buttes, which cover about 36 square miles.

In the Mexican portion of the desert are the Co-co'-pah mountains, which run only about 90 miles in a north-westerly and south-easterly direction, and have an average altitude of 2,000 feet. At the western base of these mountains is Lake Maquata (pronounced, *Mah-quah'-tah*), which is about 40 miles long, and 8 miles wide. Its waters are very salty.

The soil of the desert is composed mostly of sand and gravel, covered in many places with vast deposits of different salts, and in some localities with large bodies of common salt.

Scattered here and there are many beds of hot, wet mud, which heave and fall with escaping sulphurous gases, and which are popularly called "volcanoes." Near the Cocopah mountains is an extensive region of these volcanoes of greater or lesser size, with accompanying mineral springs.

The only streams which run in to the desert, except New River, are the White Water, San Felipe and Carriso, on the west side. The two last-named have water only for a short time during the rainy season. What little water they ever do carry is rapidly absorbed by the desert sands.

Owing to the extreme lack of moisture and the excessive heat during a greater part of the year, only the hardiest members of the vegetable kingdom are able

to grow, and that in the most favorable localities. The principal tree is the mesquite (pronounced, *mess-keet'*, the *Prosopis Juliflora*). The Indians subsist chiefly on its beans. There are many varieties of cactus, including the saguaro (*C. Giganteus*). Grasses flourish only for a brief period on the overflowed lands after the floods. In some localities the forests of mesquite are quite extensive, and in many places along the northern edge of the desert are groves of the fan palm (*W. Filifera*), which bears a very sweet fruit.

The Indians, who inhabit this region, number about 400, and belong to the Cahuilla (pronounced, *Kah-weel'-yah*) tribe; they are a long-lived race.

The fauna is restricted to the coyote (*Canis Latrans*), the scavenger of the ground, and the vulture (*Cathartes Aura*), the scavenger of the air; and in the limited mesquite forests are many varieties of birds of bright-hued plumage or sweet voices; besides rabbits, reptiles, etc.

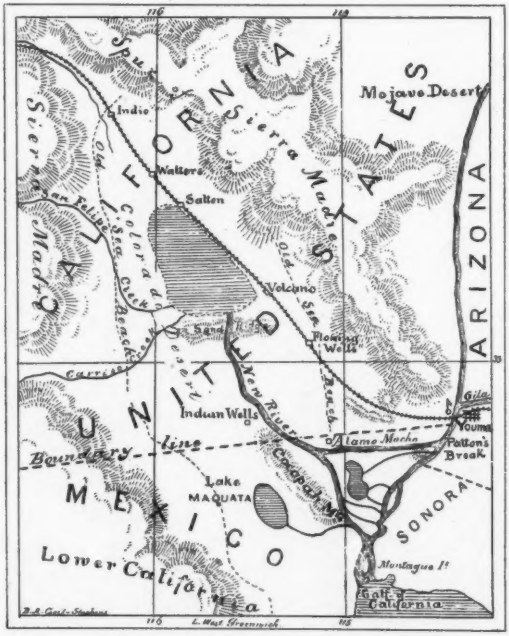
The average annual precipitation is about two inches, evaporated almost as quickly as it falls. The heat from February till November ranges from 110° to 130° F.

A vast, verdureless and waterless plain, with high and barren mountains on either hand, a burning sun fiercely glaring upon hot, white sands occasionally stirred by an atmosphere like a furnace-blast, briefly paints a picture of the Colorado desert.

The first white man to cross the Colorado desert was Captain Juan Bautista de Anza, who, under royal orders from Spain, in the year 1774, went from Yuma to San Felipe pass, in exploring an overland route from Sonora to California. The San Gorgonio pass, through

which White Water River flows, was subsequently more travelled. This was the way of the Argonauts of 1849–50, of whom some 60,000 came by the southern route, many of whom were lured to death by the mirage, common to all deserts.

In 1877, the Southern Pacific Railroad was built from San Gorgonio pass, skirting the eastern edge of the desert, to Yuma. Its surveyors determined the different points of the road below sea-level as follow, in feet: Indio, 20; Walters, 195; Salton, 263; Volcano, 225; Flowing Wells, 5; a distance of 59 miles.



Mr. Cecil-Stephens assumes all responsibility for his map.

This great depression has always excited more curiosity and interest than any of the many other wonders of the desert. It is about 130 miles long with an average width of 30 miles. Its entire rim is sharply defined by water-worn rocks and old sea-shells; in fact, it is the beach of an ancient sea. When and how was this old lake dried up? A slight examination of the geography next to the Gulf easily answers these questions.

Touching the desert on its eastern side, and from 100 to 400 feet above it, is the Colorado River on its 1,400-mile course from the Rocky Mountains to the Gulf of California. Its waters are colored red by the immense amount of sediment which they carry; hence the name. All the land between Yuma and the Gulf, a distance of 160 miles, has been made by the river, whose banks are higher than the country on either side.

There is an old Spanish map, which marks the Gila River as emptying directly into the Gulf; and, while this was once undoubtedly true, it was long prior to the time of that map-maker. The Gulf then extended some 200 miles north of its present limits to the neighborhood of Indio. The river floods, assisted by the Gulf tides, formed the bar which divides the Gulf from the old desert sea-bed. This bar is only about 15 miles wide, and surveys show that a channel could be easily cut through it.

As the waters of the desert sea evaporated, they became heavier from their salty parts, and gradually retreated towards the lowest portion of the bed, where the greater quantity of their salt was deposited. This accounts for the large mine at Salton, which is worked for commercial purposes.

In 1859, Dr. O. M. Wozencraft obtained a conditional cession from Congress to run an irrigating canal from the river near Yuma westerly on the desert for reclaiming some 1,600 square miles of arable land. Surveys demonstrated the practicability of the scheme, but the Doctor's death stopped the work.

II.

The Colorado River seems to have repented of its evil work, and is now seeking to atone for its great sin, in desolating so large a portion of the earth, by refilling the desert sea.

From 15 to 40 miles above the Gulf there are many breaks in the west bank of the river, from 20 to 50 feet above sea-level, through which the water flows in the flood seasons. The channels from these breaks unite in one, called New River, which runs back down into the desert over 100 miles to the Indian Wells region, 38 feet below sea-level. One branch of New River feeds Lake Maquata.

Twice a year, in February and June, the Colorado River is full; first from the heavy winter rains in the Rocky Mountains and again from the melting snows in summer. Since 1871, twenty years, New River has extended its channel northward fully twenty miles. In this work it has been assisted by the great tidal wave or *bore* of the Gulf, which has been marked at Montague Island, at the mouth of the river, as high as 32 feet. This *bore* comes in with the spring tides, and rushes far up the Colorado and New River. It is very dangerous to navigation, but it announces its approach with a roar that is heard for miles.

Hitherto, the floods of New River have not reached as far north as Salton because of a sand ridge formed by the winds across it, about ten miles long, a half a mile wide and nine feet high.

The winter of 1890–91 was one of the wettest ever recorded on the Pacific coast. Heavy rains fell for a long time, and all the streams were running bank-full and overflowing for a greater period than usual. The Colorado River reached the highest point ever known, since observations were first taken in 1850, being marked at Yuma at 33 feet and 6 inches, in February, 1891. This last high water caused New River to boom as never before, but the results were not apparent till the following June.

On the 23d of that month the people at Salton first noticed small streams of water trickling down into the marsh. Day by day the water has increased in volume until now a lake forty miles long and ten miles wide, with an average depth of four feet, is visible to the west and south. The daily average rise has been and continues at the rate of about one inch.

The discovery created a sensation which the press speedily published far and wide.

About two weeks later, two prospectors returned to San Diego City, and reported that the Indian Wells region, containing about 3,200 square miles, was flooded by New River. Later, a Mexican rode up from Lower California on horseback, along the eastern side of the Sierra Madre, till he found a place shallow enough to ford, when he crossed to the railroad, and confirmed the report of the flooding of the Indian Wells country.

The water continuing to rise at Salton, and no satis-

factory account of its cause being known, Mr. H. W. Patton, of the Banning *Herald*, being outfitted by the San Francisco *Examiner*, left Yuma on July 9th in a small boat, accompanied by guides, and sailed down the Colorado River about forty miles, where, at a point about 340 feet above the lowest part of the desert, he found a break in the west bank about a mile wide through which the water is flowing down into the desert.

Here, a bar is forming, which it seems will eventually turn the whole volume of the river into the desert. Turning into the main channel, which is about 200 yards wide and 18 feet deep, with a current of 4 miles per hour, they floated along over the old overland stage route. Marks on the trees showed that the water had been 4 feet higher.

At Alamo Mocho, an old station 52 miles southwest from Yuma, there was water all over the country as far as they could see. Ten miles west of Alamo Mocho they met the New River stream, coming from the south, 100 feet wide and 12 feet deep. Here the two streams united, and turned to the north, 300 yards wide and 14 feet deep with a current of 6 miles per hour. At places the stream spreads out into large lakes.

On the 12th they passed through a large break in the sand ridge, which hitherto prevented the New River floods from entering the Salton basin. This break was 200 yards wide and 7 feet deep, and the current was very swift. After going through this break they saw 10 large streams join their channel on the west, showing that there are other breaks in that direction. Sailing through a chain of lakes on the 14th, they saw a large stream flowing in from Carriso Creek, and that even-

ing they safely landed at Salton, having made a voyage of over 200 miles, and demonstrated the source of the flood.

Last May the annual summer rise of the Colorado began. July 19th, the river marked 21 feet and 8 inches at Yuma. Low water mark is 12 feet, although it has not been below 14 feet and 6 inches for 13 years. This summer rise, aided by a bore in June, caused the waters of the Indian Wells basin, already filled by the February flood, to break through into the Salton basin, 225 feet lower. The desert area flooded to date is not less than 3,500 square miles.

III.

Will the flood be permanent? It seems that this question can be answered in the affirmative. The channel at the Patton break has been cut so deep that the water will continue to flow through to the desert at the lowest stages of the river. Hitherto, New River has always flowed when the Colorado marked 19 feet at Yuma. For months past the Colorado has poured down past Yuma 100,000 cubic feet per second to probably ten times that amount, the bulk of which has found its way to the Gulf, but a large portion has gone to the desert. According to the figures of conservative engineers, the inflow into the Salton basin the past 60 days has been not less than 8,548 cubic feet per second, exclusive of the evaporation and infiltration, which is very great for the distance of 200 miles.

If the sea becomes permanent, it may be a matter of only a short time till the Gulf is again connected with its old bed through New River. At all events the California peninsula will simply be extended northward

about two degrees of latitude, and with it would naturally come the finer climate of the peninsula. Southern California would then have summer rains, and its annual precipitation and irrigating supply would be increased.

The prevailing winds of Arizona are from the north and west over waterless wastes. The Colorado sea permanent, and the heights of the Mogollon and the Sierra Blanca would wring out of the moisture-laden winds a sufficient amount of rain to greatly increase the irrigating supply of that region. Perhaps it was when the Colorado River built its banks south to the Gulf, and dried up the desert sea, the Arizona mountain streams so decreased that the builders of the Casa Grande found it no longer profitable to war with nature and Apaches, and moved to the more favored vale of Anahuac.

LOS ANGELES, August 6, 1891.

Editor's Note.—It is of interest to reprint from the New York *Times* the remarks made by Maj. J. W. Powell, Director of the U. S. Geological Survey, to a reporter of that paper, in July:

The cause of the inundation, namely, the overflowing of the Colorado River through a newly-made mouth, had been correctly stated in the *Times*, he said, some time ago, and while this had cleared away all the sensational stories of a subterranean channel and stripped the phenomenon of all its mysterious elements, still there were many facts which were of interest in connection with the occurrence, because what had happened in this case might happen at the mouth of any river which had a delta.

"The traditions of the Indians are by no means the only evidence that this basin has been filled, wholly or partially, before," he said. "Since the delta was formed and that portion of the Gulf of California was cut off and left to evaporate under the terrific heat of the sun, the Colorado has been playing pranks of this sort on several occasions. Along the hills which form the sides of this basin there are shore-marks

which indicate that at different times the basin has been flooded to different heights, and then, when the river cut back through its old channel, evaporation has again changed the lake to a parched desert. Along these shore-lines shells have been found which confirm this theory. The action of the Colorado in cutting new mouths for itself and then stopping them up is comparatively rapid, because of the quantity of silt which the stream carries. It is not unlikely that the supposed traditions of the Indians are facts within the memory of some of the older ones of the scattering bands that live on the hillsides along the basin, for indications are that the valley has been inundated within fifty years, and certainly it has at least once or twice since this continent was discovered.

"There is no immediate danger of the basin being filled, because it requires a large volume of water to fill it to the river level, and the evaporation is something wonderful. At the present time, according to reports, only a fraction of the water in the Colorado is flowing from this new outlet. It is possible that the channel may be enlarged as the stream flows through it so that all the water in the river will pour into the basin. Even if that were to happen the evaporation is great enough to take up fully one-half of the Colorado as it spreads over the basin, and it would probably require from two to three years for the balance to fill the hole up to level. At times, when essentially the same thing has happened, a flood in the main body of the river has washed away the deposits at the mouth and the river has emptied itself from its natural mouth again, leaving the basin half filled. At such times as the river filled the basin to its level the flow to the Gulf of California has been through a channel which begins at the lower end of the basin and makes a short cut directly south to the salt water. This is called Hardy's Colorado, and it is usually simply a dry channel or ditch. It may have been formed under circumstances similar to those existing at present. It is large enough to accommodate the entire volume of the Colorado after the evaporation which is sure to take place while the water is spread over the basin.

"Some idea of the terrible heat may be had from the evaporation which takes place. If the basin were filled to the river level, the lake would present a surface of about 1,600 square miles. This would be lowered at the rate of six feet a year by evaporation. The salt which is now being mined at Salton was deposited by the previous evaporations. The original salt deposit from the water which was a part of the Gulf of California is not responsible for all that is found there. The waters of the Colorado are saline, for the river flows through beds of rock salt at places many miles up from its mouth, and the successive deposits from the waters of this river as they have flooded the valley and then dried up have added largely to the original deposit."

THE PRETENDED DISCOVERY OF THE SOURCE OF THE MISSISSIPPI RIVER.

BY

CAPT. WILLARD GLAZIER.*

Editor's Note.—This paper was read before the Congrès at Berne, on the 12th of August, 1891, by Mr. Francis A. Stout, Vice-President of the American Geographical Society, and was referred to a Committee, composed of Sir George Bowen, Maj. Post, U. S. A., Messrs. Napoléon Ney, A. de Claparède and E. v. Hesse-Wartegg. The Committee reported, August 13, that Captain Glazier's claim was without foundation, and that the sources of the Mississippi were discovered by Schoolcraft, Lieutenant Allen and Nicollet.

It is proposed to state Capt. Willard Glazier's claim to the discovery of the true source of the Mississippi River; to recall with brevity the historical facts as to the real discovery; to show the character of Captain Glazier's pretended exploration; and to ask of the Congrès International des Sciences Géographiques such an expression of opinion as may establish the truth.

Captain Glazier's claim was first made known by the following letter (published, with the map to which it refers, in the *Proceedings* of the Royal Geographical Society of London, Vol. VII. (1885), pp. 23–25):

"The true source of the Mississippi has been a vexed question among American geographers for some time,

*The name Willard Glazier is not to be found in the U. S. Army Register, nor in the List of Officers of Volunteers, 1861–1865, in the records of the War Department, nor in the U. S. Navy Register.

the country around its head waters being in a very wild condition, inhabited only by Indians, and access to it difficult of accomplishment. In June, 1881, I organized and led an expedition with the object of settling forever the question of the source of our great river.

"We proceeded in canoes viâ Leech Lake to Lake Itasca, and accompanied by an old Indian guide, pushed forward to the south, and were rewarded by the discovery of another lake of considerable size, which proves to be, without the shadow of a doubt, the true source of the Mississippi, in lat. 47° 13′ 25″. From notes taken during the ascent, it cannot be less than three feet above Lake Itasca—the hitherto supposed source of the river.

"The Mississippi may, therefore, be said to originate in an altitude 1,578 feet above the Atlantic Ocean. Its length, taking former data as the basis, may be placed at 3,184 miles. The origin of the river in the remote and unfrequented region of country between Leech Lake and Red River, not less than an entire degree of latitude south of Turtle Lake, which was for many years regarded as the source, throws both forks of the stream out of the usual route of the fur trade, and furnishes, perhaps, the best reason why its head has remained so long in enveloped in obscurity.

"I take the liberty of enclosing herewith a map showing my route and the true source of the Mississippi.

"MILWAUKEE, WISCONSIN, June 17th, 1884.

"*To the Secretary, Royal Geographical Society.*"

The letter as printed in the *Proceedings*, is without signature, but has the heading:

"*Discovery of the True Source of the Mississippi.*
By Captain WILLARD GLAZIER (U.S.)."

It does not appear that Captain Glazier's letter was introduced, or supported by the authority of any person known to the Royal Geographical Society. He threw himself, unknown as he was, upon the generosity of the Society, and was received with large hospitality.

The historical facts with regard to the real discovery of the source of the Mississippi were admirably stated by Mr. Russell Hinman of Cincinnati, Ohio, in a communication to the New York journal, *Science*, Vol. 8 (1886), pp. 142–145; and more at length by Mr. Henry D. Harrower of New York, in a pamphlet, published in October, 1886. The record is as follows:

The earliest exploration beyond Cass Lake (which lies N. E. of Lake Itasca) was made by Henry R. Schoolcraft in 1832, under authority of the War Department. Schoolcraft made an official report on the 1st of September, 1832, and published in 1834 the narrative of his expedition, with a map, compiled by Lieutenant Allen. On this map Lake Itasca is laid down as the source of the Mississippi, and on p. 58 of the *Narrative* is the passage: "The outlet of Itasca Lake is perhaps ten to twelve feet broad, with an apparent depth of twelve to eighteen inches. The discharge of water appears to be copious, compared to its inlet." This inlet, leading from a smaller lake to the south of Itasca, is indicated on the map.

Four years after Schoolcraft, (in 1836) Mr. J. N. Nicollet* made an instrumental exploration of this region. His report and map were published by the

* Mr. Nicollet was a native of Chambéry, Savoy. He was a trained scientist, who had worked with Laplace and had filled the chair of mathematics in the Collége Louis-le-Grand.

U. S. Bureau of Topographical Engineers as "Senate document No. 237, 26th Congress, 2d Session, 1843." In this report he says (pp. 57–59): "There are five creeks that fall into it (Lake Itasca), formed by innumerable streamlets oozing from the clay beds at the bases of the hills . . . known here by the name of 'heights of land.' . . . These are the waters which I consider to be the utmost sources of the Mississippi. Now, of the five creeks that empty into Itasca Lake, one empties into the east bay of the lake, the four others into the west bay. *I visited the whole of them;* and, among the latter there is one remarkable above the others, inasmuch as its course is longer, and its waters more abundant; so that, in obedience to the geographical rule 'that the sources of a river are those which are most distant from its mouth,' this creek is truly the infant Mississippi. The day on which I explored this principal creek (August 29, 1836) I judged that, at its entrance into Itasca Lake, its bed was from 15 to 20 feet wide and the depth of water from 2 to 3 feet. . . . After having devoted three days to an exploration of the sources of the Mississippi, and spent portions of the nights in making astronomical observations, I took leave of Itasca Lake. . . . The honor of having first explored the sources of the Mississippi, and of introducing a knowledge of them into physical geography, belongs to Mr. Schoolcraft and Lieutenant Allen. I come only after these gentlemen; but I may be permitted to claim some merit for having completed what was wanting for a full geographical account of these sources. Moreover, I am, I believe, the first traveller who has carried with him astronomical instruments, and put them to

profitable account along the whole course of the Mississippi from its mouth to its sources." On pp. 124-125 of his Report Nicollet gives his determinations of the geodetic position and the elevation of the region. He places Schoolcraft's Island, in Lake Itasca, in N. Lat. 47° 13′ 35″ and W. Long. (from Greenwich) 95° 2′. The elevation of the island is 1,575 feet above the level of the Gulf of Mexico; and, in Nicollet's own words, "the utmost sources of the Mississippi, at the summit of the height of land six miles south of Lake Itasca," have an elevation of 1,680 feet above the Gulf.

Nicollet finished the work he undertook to do. He explored and described and mapped the sources of the Mississippi, from the rills that trickled down the Height of Land to collect in Lake Itasca to the lake itself, and the River Mississippi that flowed from it. Every later exploration by competent men has confirmed the authority of his survey. He bestowed no name; but in 1879 the engineers, who subdivided the district into one-mile sections under the orders of the U. S. Land Office, gave to one of the lakelets formed by the widening of the creek, which Nicollet described as the longest of the four on the west, the locally-known name of Elk Lake. The U. S. Land Office Map of Minnesota, issued in 1879, shows Elk Lake a little to the south of Lake Itasca.

These are the facts concerning the discovery of the sources of the Mississippi.

Captain Glazier states in his letter to the Royal Geographical Society that he made his expedition in June, 1881, but he does not add that he took with him a copy of the Land Office Map. In the detailed account of

his trip, published in 1884, the *American Meteorological Journal* (Vol. I.), of Detroit, Mich., he unwarily fixed the position of Lake Glazier (Elk Lake) in N. Lat. 47° 13′ 25″, its height above sea level at 1,578 feet, and its distance from the sea at 3,184 miles.

Mr. Russell Hinman showed, in his communication to *Science* (in 1886), that Captain Glazier's latitude of Lake Glazier is only 10 seconds less than the latitude of Schoolcraft's Island, in Lake Itasca, as determined by Nicollet; that this difference of 10 seconds is equal to 1,013 feet, 3 inches, the degree of latitude between 46° 30′ and 47° 30′ N., measuring, according to the U. S. Coast Survey Report, 1884, 69.079 miles; and that the pretended latitude of Lake Glazier places it actually *within* Lake Itasca.

Mr. Hinman showed also that the "Meteorological Observations at the head waters of the Mississippi," from July 17 to August 2, published by Captain Glazier as his own (*Am. Meteorological Journal*, Vol. I., p. 328), were copied, word for word and figure for figure, from a table of observations made by Schoolcraft in 1820 (see Schoolcraft's *Narrative*, ed. 1855, p. 423).

These exposures of his method put Captain Glazier upon his guard. He has never since made a precise statement; and his thick volume, entitled *Down the Great River*, published at Philadelphia in 1887, while it professes to give an account of the "Discovery," is wholly taken up with trivial adventures and descriptions.

In one word, Captain Glazier discovered nothing; but by persistent self-assertion and the help of serviceable publishers, he succeeded in imposing his Lake

Glazier upon the people to such an extent that it became necessary for the Legislature of the State of Minnesota to pass the following Act:

CHAPTER 69.

H. F. NO. 702.—AN ACT TO FIX THE NAME OF A LAKE FORMERLY KNOWN AS ELK LAKE.

Be it Enacted by the Legislature of the State of Minnesota:

SECTION 1. That the lake known for many years to the Indians and early explorers as Elk Lake, situated in Beltrami county, in section twenty-two (22) of town one hundred forty-three (143) north, range thirty-six (36) west, fifth principal meridian, shall be known and designated hereafter on all official maps of the State and named in all county and State records referring to the same, as "Elk Lake."

SEC. 2. No edition of any school geography, published subsequent to January one, eighteen hundred and ninety, which contains any map giving any name to the lake specified in section one other than "Elk Lake," shall be used in the schools of this State.

SEC. 3. This act shall take effect and be in force from and after its passage.

Approved April 24, 1889.

In the same year the Minnesota Historical Society, of St. Paul, commissioned Mr. J. V. Brower, with a party of engineers and assistants, to make a minute topographical and hydrographical survey of the Itascan basin. The work has been accomplished, but the report has not yet appeared in print.

It is under a sense of duty to all honorable workers in the field of science that the American Geographical

Society submits to the Congrès International the foregoing history of a pretended exploration by a man, of whom it must be affirmed, on the evidence of his own writings, that he never saw the head waters of the Mississippi.

GEO. C. HURLBUT,
Librarian.

NEW YORK, March 15, 1891.

REPORT ON EXPLORATIONS IN NORTHERN MEXICO.

BY

CARL LUMHOLTZ.

After having visited the Zuñi, Moqui and Navajo Indians of Arizona I last summer proceeded to the City of Mexico in order to make the necessary arrangements with the Mexican Government, with regard to my intended explorations of the Sierra Madre. The way had been prepared for me in Mexico by the kind offices of the Secretary of State, Mr. Blaine. President Diaz and all the members of his Cabinet afforded me every imaginable facility and support. Orders were given to pass my baggage and supplies free of duty and to furnish a military escort whenever needed, and I was further provided with letters of recommendation to prominent persons in Northern Mexico. I then returned to the United States to organize the expedition. Tremendous floods in the southern part of New Mexico and Arizona retarded my work for about a fortnight, but at last in the beginning of September, 1890, I was able to make a start from Bisbee, Arizona, for Sonora, Mexico, travelling in a southerly direction.

The main object of my expedition, which I have the honor to conduct under the auspices of the American Geographical Society and the American Museum of

Natural History, is to make researches into the ethnology and archæology of Northern Mexico. The Sierra Madre, the broad mountain chain that stretches from the United States through a great part of Mexico, has in its northern part never been scientifically explored.

This region, the continuation of the Rocky Mountains, offers a wide field for scientific exploration, now that the reduction of the fierce Apaches to submission by General Crook, in 1883, has opened the country to peaceable men, the present expedition being the first to take advantage of this change. Small bands of Apaches are still left there, and others are constantly breaking away from the San Carlos Reservation. The Mexican knowledge of these mountains may be thus briefly summed up : that it is a tremendous mountain country and difficult of approach. It would sometimes take eight days to reach the top of one ridge. There are, besides, great pine forests alive with deer and bears, wonderfully large woodpeckers that are able to cut down whole trees, plenty of remains of long ago vanished people who lived in towns and tilled the soil, and built monuments and even bridges over some of the cañons.

A story is told by an American, who had lived among the Apaches for a number of years, of a beautiful and fertile valley, which showed traces of a former dense population in the ruins which remained, and the great number of planted fruit trees still bearing fruit. There were once worked in this wild part of the Sierra two famous mines, the location of which is now lost. They are said to have been the property of the Jesuits, who, before

their expulsion from Mexico, held nearly all the mines in the country. The tradition says that the Apaches killed every soul in the two mines of Vainopa and Tayopa, and so they were forgotten until recent times, when people studying the old church books and other early Spanish documents discovered the record of their existence. Several expeditions have been sent out, one, I believe, by the Government, but in vain. Being situated in a very rough country, these mines are still awaiting their re-discoverer, and the Governor of Chihuahua, who told me much about them, felt very sanguine that I was to be the lucky one to find them, encouraging me by saying that if I found Tayopa it would be worth fifty million dollars. More than the prospect of riches, to which I am not indifferent, my zeal for science is stimulated by the hope of meeting in the Sierra Madre with people who are living to-day as they were before the coming of the Spaniards.

I have reason to believe that in the rugged fastnesses of these almost unknown regions there may dwell tribes who are in the most primitive state of culture, even to the extent of dwelling in cliffs and caves. The old church books of Bacadehuachy tell us, says Mr. F. A. Bandelier, of the Jesuits going out in the mountains to administer the sacrament to the Tarahumari Indian who were living in caves and cliffs. But I am convinced that many of this same tribe are still living in that way; there may be others. What light might one not hope to throw on the early development of the American race by a close study of the culture, manners and mode of life of such primitive people!

I had with me a party of scientists and assistants, rep-

resenting archæology, botany, zoology, mineralogy and geology.* Prof. W. Libbey, Jr., of Princeton, N. J., took part as the physical geographer of the expedition, bringing with him his laboratory man. We were fully provided with a photographic camera, two kodaks, one detective camera, assaying outfit, anthropometric, meteorological and geodetic instruments, etc.

As we left the dreary plains of Arizona behind us we entered upon a more pleasing country, where the hills sloped to the sparkling streams, that ran between banks lined with the wild grape vines, the cotton-wood and other trees, and the landscape was fresh and green after the heavy rains.

Among flowers is noticeable on the river banks the exquisite, gorgeous, white *Datura Metalloides.* Its crown is six inches long and four inches broad. We saw one cluster of this creeping plant fifty feet in circumference. It is well known on account of the disfavor with which it is regarded by the better class of the Navajos, the root being employed as an aphrodisiac, and its use often resulting in madness or death. The effect of the poison is cumulative, and the Indians under its influence are like Malays running amuck and trying to kill all they meet.

A plant of the cucurbitaceæ was the *Lagenaria,* with its carrot-like root, six feet in length, used here as soap. Among birds the most numerous were flycatchers and doves.

The first pueblo passed was Fronteras, once the scene of many desperate encounters with the Apaches.

* Messrs. R. Abbott, G. Haviland, A. M. Stephens, C. V. Hartman, F. Lloyd, F. Robinette and H. White.

Here I dug out eight valuable Apache skulls from a well, into which a number of men and women had been treacherously thrown by the Mexicans.

Passing Cochuta to the south, we met with an extensive stratum of fossils, but had no time to make any excavations. Several gigantic animals have been washed out here by floods and carried off. Many signs of former habitation appear in the neighborhood in the form of ruined pueblos. In one of these we saw stones arranged in a parallelogram measuring fifty feet long and half as many wide. No built wall was underlying these surface stones; and sometimes they are set in a circle. A lot of broken pottery and arrowheads we gathered in the ruins, with which the whole country abounds. Gold and coal were found in this district in considerable quantity, but yet not enough to make them an object for mining.

Some forty miles south of Cochuta I turned in a southeasterly direction and climbed a hilly plateau, 3,200 feet above sea level. The geological formation was still volcanic and metamorphic rock. Here we found the first orchids, yellow in color and deliciously fragrant, and in the cañons below we saw the first palms. We then descended to the Bavispe River, a name here given to the upper part of the Yaqui. It is worthy of remark that the Mexicans designate the same river by different names in different parts of its course.

We followed the river to the south, passing Ópata, Guasabas and Granados.

The country was fertile but dry, and the heat was great. Even at the end of October the thermometer marked nearly 100° Fahr. in the shade. There were

fields of sugar cane, and in the orchards grew orange trees, figs and lime trees in abundance. Grass had become dry and scarce, and it was difficult to keep our animals in condition.

The Mexicans of Eastern Sonora are here not easily to be distinguished from the Ópata Indians. In the different pueblos on the Bavispe our large party, with the animals and baggage, created quite a sensation among these people and roused them from the routine of their uneventful daily life. Every day they came to consult me for their ailments, and it was of no use to tell them that I was not a medical man and that I could not give them remedies. They would have me feel their pulse, and tell them what was the matter with them, how long they were going to live, etc. A great many of them were suffering from indigestion. There were a number of deaf and dumb persons among them, the result of their constant intermarriage; there were cases of epilepsy, also, and some of insanity.

A curious case of a man coming very near to being killed by the maggots of the blue screw-fly came to my notice. He was a soldier, who once in a fight had got his nose cut off, his nostrils thereby becoming entirely exposed. One night when he was drunk the screw-fly laid its eggs in his nose, and when these were hatched it seemed as if he was to be eaten up alive. I gave the man some relief by syringing the place with a solution of corrosive sublimate, but an intelligent Mexican, who had an extensive knowledge of native medicinal plants, with which the country abounds, many of them no doubt very valuable, treated the patient and in two days he seemed to be in a fair way of saving the poor wretch.

Several of my mules and donkeys were attacked in the same way by maggots in sore places, and it was exceedingly difficult to free the poor animals of this disgusting plague.

I was assured that there never had been a thief known in this place. However that may be, one thing is certain, that the Mexicans of Eastern Sonora are a nice class of people. They are pleasant to deal with, very active and obedient, and I never wish for better men than I have at present in my camp, nearly all of them being from these parts. The influential men, one or two in each town, are very obliging, and they tried to help me in many ways. People are ignorant, for instance, and do not believe in checks except when they are green! But I was always helped out by some comparatively rich man, who knew more than the others, and assisted me to cash the checks, going with me from house to house collecting together all the cash in town.

Near Granados are three extensive pueblos in ruins. There are also some interesting petroglyphs only two and a half miles north-west from town. The designs were rudely picked on a moderately smooth felsite rock, about forty feet above the bed of the valley. Some of the figures represent evidently the *patolachi* or deified dragon-fly found almost universally among the ruins of Arizona and Northern Mexico. The significance of the designs to the modern village Indians is the wind deity, beneficent in distributing the winds. There were also found the concentric circles, the conventionalized spiral and the meander design so common among the northern Indians, and still in use among the Moquis. All the figures of the deities are drawn in the characteristic

style that we find in the north, their hands and feet defined with three radiating lines like a bird track.

We were now in the beginning of November. I had of late suffered considerable losses and annoyance by having my convoy of supplies stopped at a frontier custom house. The Mexican Government showed me, however, their good will by punishing very severely the inspector, who caused me this trouble, for going beyond his orders.

From Granados we took a more easterly course, at last being able to cross the Bavispe River, which for some time had been in flood on account of heavy rains. The country now gradually rose, and after a fortnight's march through mesquites and oaks we reached Nacory, a small, poor town at the foot of the Sierra Madre. Bacadehuachy, which we pass on our way, has a cathedral, built of adobe, but vast and extremely massive.

In this region Mr. Hartman, our botanist, found a new species of agave, which is strikingly beautiful, with delicate stripes of white, running in concentric circles on the rosette of lanceolate leaves, that constitute the plant. The flower stalk is 12 to 13 feet high.

Near Nacory we spent some time making excursions in the neighborhood and preparing for the crossing of the Sierra Madre, whose mighty ranges spread themselves before us one after the other like so many impassable barriers.

Through the inhabitants of the little hamlet I found out, that there are several deposits of fossils, or *huesos giganteos*, as they are called in these parts of the world, people imagining that the large fossils are remains of

giants. In one valley, 6 miles south of Nacory, is a bed of clay 1½ miles long and 30 feet deep, and in the edge of the bed Mr. White found what he took to be a horn, 6 feet 8 inches long, and 26 inches around at its greatest circumference. It was not petrified, and in color it was a rich mahogany brown. It had no bone core, the hollow being filled with clay. Prof. O. C. Marsh, to whom I have given the measurements but no sample of the find, thinks it to be the tusk of a mammoth. Thus it would be the first time that this animal was found so far south.

After having received some supplementary provisions from Granados, I at last on the 2d December began the ascent of the Sierra Madre with a party of 30 men (including the scientific corps) and about 70 pack mules and burros. There are four great Sierras to cross, at an elevation varying from 8,000 to 9,000 feet, and the country, as may be imagined, is at times extremely rough. We made our own trails, 4 men going 2 or 3 days ahead of the main body, sometimes guided by Apache tracks. I had the trails cut zig-zag instead of the Mexican way of going straight up like a goat, and to this I attribute being at all able to pull through, as it saved the animals enormously. In some places our pack animals had to be led one by one alongside of yawning abysses. Many a time the beasts lost their balance and rolled down the mountain sides.

The Mexicans appeared quite accustomed to such accidents, and in fact they seemed to be in the regular line of Mexican travel. Strange to say, I never lost one animal that way, but, from December to February, 13 died from exhaustion or sickness caused by the cold

weather and the poor quality of grass. Several times we had snow, once, in January, 7 inches deep, the coldest night (10 January) showing a temperature of 6° F. Christmas day the black bulb thermometer showed in the sun 150° F., while at night the temperature had been 22°, a difference of nearly 130 degrees. Even a rattlesnake was that day brought out by the heat. Water and grass were plentiful, but the grass was of poor quality.

The landscape was magnificently wild with high towering mountains and deep chasms, or again a seemingly infinite succession of ridges and plateaus, covered with pine trees never touched by an axe. The steep slopes in the valleys and crevasses are covered with slippery pine needles 8 or 12 inches long, while the pines tower up to a height of 100 feet; the forests have a remarkably young and fresh look about them; now and then on exposed places we met with trees split like matches, telling us what terrific winds sometimes may blow over these solitary regions.

In the cañons at an elevation of 6,000 feet Resurrection plants (*selaginella sempervivens*) cover the damp rocks and shady cliffs like a mat. Six or eight species of ferns, among them the beautiful maiden-hair fern, are also found, and the maples with their autumn coloring carried the Americans back to home.

Helianthus was on the 4th of December found growing in these cañons, while elders were observed with leaves and flowers at the same time. *Bambusa* forms here frequently a thick light green undergrowth of beautiful contrast to the dark shades of oak, elder and palms. A species of *salvia* with deep scarlet flowers is

very striking. At an elevation of 8,900 feet, the highest reached on our route, was found a species of violet, a *lupinus* and a *vicia* (the latter two yielding an excellent fodder for cattle). Piñon trees and strawberry trees (*arbutus texana*) are frequently met with.

In the western parts of the Sierra Madre we found game scarce, as, for instance, in the country around the Bavispe River, but near the *mesas* and *cordones* the forests were alive with deer. Also turkeys were plentiful, but only one bear was observed. In the Gabianas River, a northeasterly tributary of the Bavispe, the fish were found in numerous quantities in all the water pools, it being just the time for their spawning (January); they were big suckers and trout, of excellent quality and very fat.

Among birds must be mentioned *campephilus imperialis*. This magnificent bird, which is 21 inches long and is therefore the largest woodpecker on the globe, was seen several times. They go in pairs, are not very shy, but cannot be killed except by the rifle. It is peculiar to them that they will feed for one or two weeks on one tree, so that in many cases the trees fall down. I brought back several specimens of this bird, which is extremely rare in the museums.

This Sierra Madre region is very rich in remains of a long ago vanished race of people, of whom history as yet knows nothing. Deserted pueblos containing square stone houses are frequently met with. They are generally found on top of the hills and mountains, and are sometimes surrounded by fortifications in the shape of stone walls. Isolated houses made of stone and clay and plastered, so that they look white at a distance, are also

found, and the Mexicans call them *casas blancas.* The most interesting remains are, however, in the caves, which contain groups of houses, sometimes three stories high.

Trincheras, or stone terraces, are built across nearly every little valley, ten to twenty in number in some of them, evidently for agricultural purposes. On very steep mountain sides these terraces were astonishing structures, fifteen and even twenty feet high, and of great solid stones, in the cyclopean style of masonry. They were met with even at an elevation of 7,400 feet. In one place eight terraces were built within a space of 150 feet, the aborigines having gained by the enormous labor expended only 3,500 square feet, or in other words making room for 500 or 600 hills of maize.

On the 23d of January we reached the first settlement on the eastern side of the Sierra Madre, a Mormon colony called Pacheco, which had been three months without mail. From here I sent most of my poor animals to the Hacienda de San Diego, where an American, Mr. Galvin received us very kindly, while I myself with a party of twelve explored the upper part of the Piedras Verdes river valley for six weeks longer. We had had a rather laborious journey across the Sierra, and the animals were losing strength on the poor quality of grass and the cold of the nights, and they were beginning to give out. It became necessary to lighten their load by leaving half of the baggage, to be sent for a week or two later; and this made our progress slow and laborious. We had also been on reduced rations, with a scarcity of flour, and no other meat than that we could shoot for ourselves. These incidents, however annoying, form no

great obstacle to real explorers, if only the results of their toil are satisfactory.

The most remarkable caves we met with were at the head of Piedras Verdes river, 6,850 feet above sea level. These caves contain groups of houses or small villages, and the houses are splendidly made of porphyry pulp, and show that the inhabitants had obtained a comparatively high culture. The dwellings were sometimes three stories in height, with small windows, and doors made in the form of a cross; and occasionally there were stone staircases. A very remarkable feature of these structures is that the walls, which are about 1½ feet thick, present a solid surface of as much as eight feet in height, all of one piece and whitewashed. The finds showed that these people cultivated maize, beans and cotton, and knew the use of indigo. There were seeds of two kinds of gourds, datems and palm seeds. A hunting stick like the boomerang of the Moquis, an arrow, a complete fire drill, bone needles, baskets, mats and threads of hair and plant fibre, sandals, and pottery were among the finds.

The caves, which number about fifty in a stretch of twenty miles, are from 100 to 200 feet above the bottom of the cañon, and the largest is some fifty feet high. At the entrance of one of the cave villages we were astonished to come upon a huge vessel made like an *olla* or water jar, twelve feet high and twelve feet in diameter. The sides of it were eight inches in thickness and as hard as cement, the frame being made of straw ropes, coiled and plastered outside and inside with porphyry pulp. At the bottom was a three feet high entrance, through which a person could crawl in; the top,

which was only three feet wide, was also open. It made a marvellous impression, looking at a distance like a huge balloon, and seen near by it was as fresh as if made a week before. I believe it was for the storage of maize. In one of the other caves we met with three ruins of similar but smaller vessels, their circular bases only being left. There were built also some reservoirs for grain, dug down in the bottom of the caves. In the background of this cave, which in its looks reminded us of a cider factory, were the houses built in complete darkness. In the deepest caves the houses were built at the entrance, while in the smaller ones the houses were found at the back. It is to be noted that all the caves are natural.

We could see that the Apaches had occupied some of these caves, having left their pictures on the walls. There were also other pictures of comparatively recent origin. But the houses must be old, as we found on one thirteen coatings of whitewash.

One series of caves on the shady side of the cañon had been reserved for burial places. Here at a depth of three feet I dug out a number of bodies in a wonderful state of preservation, the saltpetre, which is mixed with the disintegrated rock, having for centuries preserved them so as to look like mummies. Several of them had their features, hair and eyebrows perfect; and these were photographed. The hair is very slightly wavy and softer than that of the ordinary Indian, almost silky in fact. They were small people and reminded us in appearance strikingly of the present Moqui Village Indians. The Moquis have, like the Zuñis, a tradition that they came from the south.

The bodies were lying in rows, on their left side with the knees drawn up, and facing the sunset. Round their loins were wrapped three layers of cotton cloth and mats. Turkey feathers and feathers of the great woodpecker, mixed with cotton wadding, were found between their legs. There were no ornaments of metal, but ornamental shells and fine straw bracelets around their ankles and wrists which fell to dust on being touched, and belts of straw were found on the bodies, while near their heads invariably stood one or two *ollas* (water jars). We found with one body a bundle of "devil's claws" (*Martynia*). These are used by the Mexicans of to-day for mending broken pottery. They drill holes through the pieces and pass into them one of these claws, just as we should a rivet. The claw is elastic and strong, and serves the purpose very well.

We spent six weeks on the Piedras Verdes, where of late years some Mormon settlements have been made. They seem to be doing well, but they complain of the climate and the difficulty of raising crops; and they are gradually retreating to the plains at the foot of the Sierra, where they have prosperous communities in the fertile Casas Grandes valley. They are making explorations in a southerly direction in the mountains.

The country here also abounds in mounds, some of them monstrously large. Here would be a fine field for investigation and excavation for many years to come. With my limited force of men I could not make as extensive excavations as I wanted, but still a very considerable amount of work has been and is still being done. We have unearthed a great many polished stone implements, about 300 jars, most of them decorated

and some in very odd shapes, and several specimens of a big stone wheel and a stone cylinder fitting into it, probably used for some sort of game.

The mounds contain houses, and, as usual, most of the relics are found near the dead bodies, which are always buried under the floor, partly under the wall. These people must have been there previous to the cave and cliff dwellers, but who they were it would not yet be safe to say.

It would be premature to express any opinion as regards the antiquity of races or the people that once inhabited the now solitary regions of the great Sierra Madre district. I am just in the midst of my explorations. I have at present fourteen men in the camp, which is ten miles south of Casas Grandes, the mineralogist, Mr. H. White, being in charge during my absence; they are occupied with excavating a large mound close to the camp and also in collecting plants and birds. I have picked men, a most complete outfit of scientific apparatus, and all things necessary for an exploration of this kind, and everything is in readiness for a start again as soon as I return.

It is my ardent desire to continue these explorations, now just successfully commenced, for two years more, and I am glad to believe that I may rely upon the continued co-operation of the two learned Societies, under whose auspices these operations are conducted, which cannot fail to be of the utmost importance for the early history of this continent, as well as for the physical and biological conditions of that part of the country. My intention is to investigate accurately the language, habits and customs of the primitive people of the Sierra

Madre by living with them as I did with the natives of Australia, and I am sure that interesting results may be looked for in this virgin soil, in ethnology and archæology, as well as in other branches.

I have shipped over thirty cases of collections to Bisbee, Arizona, filled with objects of archæological, anthropological, ethnological and zoological, botanical and mineralogical interest. Over 400 photographs have been taken, and topographical and meteorological work has been done.

GEOGRAPHICAL NOTES.

BY

GEO. C. HURLBUT, *Librarian.*

THE CONGRESS AT BERNE.—The International Congress of Geographical Sciences held its sessions at Berne during the week, August 10–14, 1891. Representatives from the Societies of nearly all countries took part in the proceedings.

The Congress was opened, at 9 o'clock in the morning of August 10, the chair being occupied by the President, M. Gobat, with an address by M. Droz, of the Federal Council.

M. Gobat announced the presence of official representatives from the Governments of the following Countries: Belgium, Brazil, France, Hungary, India, Italy, Mexico, Netherlands, Portugal, Spain, Sweden, United States and Wurtemberg. In a few words he gave expression to the sorrow felt by the Congress at the tidings, unhappily confirmed, of the massacre of the explorer Crampel and his companions.

Mr. Robert N. Cust, delegate of the Royal Geographical Society, of London, spoke on the work of the European and American missionaries in Africa. He was followed by Dr. von Steinen, of Marburg, who discussed the subject of the Caribs and their origin; and Prince Henri d'Orleans then read a paper on his journey to Tibet with M. Bonvalot.

In the afternoon the members paid a visit to the

geographical exhibition, and then resumed the sitting. Dr. Penck explained his ideas on the construction of a map of the whole world on the scale of one-millionth. This map would cover a surface of 510 square metres (about one-fifth of a square mile), but, if limited to the Continents and the known lands, it would cover about one-fourteenth of a square mile. The map would consist of 1,000 sheets. At Dr. Penck's request a committee was named to report upon his proposition.

M. de Lannoy de Bissy then gave an account of his labors in working out a map of Africa on a scale of one two-millionth.

Mr. F. A. Stout, of New York, described the advantages presented by the physical features of Nicaragua and its great lake for the construction of a ship-canal; and Mr. A. R. Eckfout, of Java, spoke on the progress made in the construction of railways in the Sunda Islands.

The morning of the 11th was devoted, in the first place, to the question of the initial meridian and the universal hour. Mr. Förster, Director of the Berlin Observatory, submitted a report, which proposed the reference to the Committee on the map of the world of a resolution, calling upon the Swiss Federal Council to take the initiative of an international understanding as to the introduction of a single initial meridian, a universal hour and the application of the decimal system to the measurement of time. Mr. Förster rejected the system of horary gores (*fuseaux horaires*).

He showed that this system was nothing more than transitional and that it would press, at last, with an intolerable weight upon scientific pursuits as well as upon

traffic and the civil life of communities. He proved that for science as well as for all other forms of human industry, it was indispensable to have a local hour, though exception might be made in favor of railroad and telegraph service.

Col. Coello, president of the Madrid Geographical Society, advocated the universal hour and the reference to the Committee; and Prof. Mareuse, of Paris, spoke in favor of the horary gores, already adopted in many countries. There are twenty-four of these gores, each of fifteen degrees. M. Bouthillier de Beaumont was in favor of an initial meridian, passing through Bering Strait.

Father Tondini di Quarenghi, whose zeal knows no abatement, insisted upon the advantages of the meridian of Jerusalem; and after a very lively discussion, the whole subject was referred to a Committee.

Prof. Amrein treated the subject of the modern sentiment of nature, and, more particularly of alpine nature. Prof. Knapp presented his observations on the foreign population in Switzerland (Frenchmen 53,653, Germans 95,262, Italians 41,500), and M. de Claparède described the botanic garden *Linnæa;* and the following resolution was adopted:

"The fifth International Congress of Geographical Sciences, sitting at Berne in 1891, recognizing the interest presented by the alpine botanic garden *Linnæa*, at Bourg-Saint-Pierre (Valais), for the study of the botanical geography of all the elevated regions of the globe, resolves to recommend this undertaking to the good will and the support of all geographical societies."

Maj. Post, U. S. A., described the operations of the

U. S. Coast and Geodetic Survey, which was organized and brought into working order by Prof. Hassler, a native of Switzerland. He explained, also, what had been done by the U. S. Geological Survey in its special department as well as for the topographical map of the United States, now in course of publication.

M. Faure offered a detailed study on the state of geographical instruction in Germany, America, England, Belgium, France and Switzerland. Mr. Scott Keltie spoke of recent geographical progress in Great Britain; and he was followed by Frère Alexis, of Paris, on popularizing geographical knowledge, by Mr. de Haardt, of Vienna, on the importance of ethnography as a constituent part of geographical instruction in intermediate schools, and by M. Oppel, who spoke of maps of political economy and of exploring expeditions.

In the afternoon Prince Roland Bonaparte presented his recent publications, and General Annenkoff made an address on the subject of the importance of geographical instruction in the XIX century, as a basis of emigration and colonization. He made a comparison between the events which occurred at the close of the XV and in the XVI century, and those which pass under our eyes at the present time. "From 1492," he said, "to 1522, we stand in the presence of an immense renovation, a veritable intellectual and social revolution, an irresistible movement towards the unknown. . . . While Columbus was discovering America and was taking possession of it in the name of Spain, Vasco da Gama was arriving in India by the Cape of Good Hope. The expedition of Gama constitutes the national epoch of the Portuguese. Gama and Albuquerque seem to belong

to poetry rather than to history. It is a mixture of the lust of gold with religious proselytism, and an unmeasured need of impetuous expansion through the world, that strike us when we think of this people, occupying so small an area in Europe. Only fifteen years after the death of Columbus, Magellan discovers the long sought-for passage, and the first circumnavigation of the globe is accomplished.

"We are surely struck with amazement, when we think that almost at the same time, or, at least, within a very short period of time men of great genius, like Christopher Columbus, Vasco da Gama, Ferdinand Cortés, Pizarro, Americus Vespucius, Marco Polo* and many others make great discoveries that revolutionize the globe. . . . After this beautiful and glorious epoch, there comes a time of relative calm, a calm that lasted till the second half of the XIX century, when there begins again a feverish activity, a desire, manifesting itself like a disease, to become acquainted with far-distant countries as yet unvisited and to unite them to the civilized world, and to open in this way a new field to human activity."

Gen. Annenkoff then passed in review the work done in Africa and in Asia, in Australia and in America, by the travellers and explorers who have left almost no region of the globe untrodden. He described the expansion of colonies into great nations, the increase of population in the Old World and its overflow in emigration. "Like Alexander," he said, "and with greater reason than Alexander, we find the world too small for us."

* General Annenkoff knew of course, but forgot for a moment, that Marco Polo lived two centuries before Columbus.

In conclusion, he proposed a resolution for drawing up a uniform international series of questions on the fitness of different countries for colonization; and, after some discussion, this resolution was unanimously adopted. Mr. de Coczy, Director of the Hungarian Geological Institute, described Count Szechenyi's travels in China. The geography and natural history of Bismarck Archipelago were treated by Count Pfeil, of Berlin.

The day was marked by an incident, which carries with it a lesson in manners, if not in geography. Mr R. N. Cust, who addressed the Congress the day before, had distributed in a printed form his paper on the occupation of Africa by Christian missionaries, with the inscription: "International Congress of Geographical Sciences, at Berne, 1891."

In this pamphlet occurred the following sentence (here translated from the French) applied to the Germans: "With a brutal cynicism they have laid hands upon what they could take, without concerning themselves as to the feelings of the people and without thinking of the day, which will surely come, when they will have to render an account." *

These international sentiments, so courteously expressed, did not win the approbation of the Germans.

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* It is due to Mr. Cust to observe that his language, though apparently restricted to the Germans, is nothing more than the outcome of his long-settled convictions with regard to the spiritual nature of Europeans in general, or perhaps, of continental Europeans.

Writing in the *Proceedings* of the Royal Geographical Society for August, 1886, he said that the island of Djerba, on the coast of Tunisia, had "a population of 35,000 souls, and 360 Europeans."

Mr. Cust's devotion to the cause of the Africans and his faith in their high qualities enforce this explanation of his words, since the natural opposite of the African is not the German, but the European.

They spoke of withdrawing from the Congress in a body, but allowed the matter to pass, on reflection, and accepted the following declaration made by the President, M. Gobat, and entered in the bulletin of the Congress:

"Thus far there have been heard in the meetings of this Congress no words that were less than courteous and obliging for all nations. No one has had occasion of complaint.

"We trust that cordiality has not ceased to prevail, also, outside of the Congress, among the different representatives. There has been distributed, however, a pamphlet on the work of the missionaries in Africa, and this pamphlet contains expressions offensive to a nation represented in the Congress. We leave the responsibility of those utterances to their author, and we are far from assuming the position of censors; but we should have preferred to have these expressions remain completely foreign to the Congress. In the hope that the most entire concord will preside over our deliberations to the end, I declare the incident void."

The session of August 12 opened with remarks upon his travels in Java, by M. Fritz Du Bois. M. Arthur de Claparède gave his recollections of the Philippines; and M. Napoléon Ney, of the Comm. Geographical Society, of Paris, made a report on the Transsaharan Railway. He showed that the enterprise was comparatively an easy one, that it would return a more than sufficient interest upon the capital, and that it would be of incalculable advantage to France and to the cause of civilization. He called upon the Congress to confirm by vote the resolution adopted at Brussels in 1879, to

the effect that the construction of a railroad from the African sea-coast to the countries of the interior is very greatly to be desired. The line of the road is to be from the Mediterranean coast to Lake Tchad, and thence directly to the Niger.

Mr. F. A. Stout, of the American Geographical Society, read a paper on the pretended discovery of the source of the Mississippi by Capt. Willard Glazier. This paper was referred to a special committee.

On the 13th of August Professor Schmidt, of Vienna, explained the method employed in Austria for geographical instruction of the lower classes in the gymnasia. M. Bouthillier de Beaumont presented his planisphere, and M. Chardonnier, of the Berchem-Sainte-Agathe Institute for the Deaf and Dumb, proposed a new division of the earth in place of the accepted torrid, temperate and frigid zones. The subject of reform in the spelling of geographical names occupied the attention of the Congress, which unanimously recommended the report made by M. Barbier, of Nancy. M. Forel spoke of the Subalpine lakes, and the hydrographic charts representing them ; and M. A. Delebecque, of Thonon, presented his own maps of the lakes of Annecy, Bourget and Geneva. The Congress expressed the hope that these surveys would be extended by the States, so as to embrace all the lakes.

A superb map of Etna was presented by its author, Prof. Emile Chaix. The subject of relief maps was attentively considered. There were discussions on meteorology and on geographical bibliography, and a resolution, looking to the institution of international committees for preparing this bibliography in each

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country, was offered by M. Guillaume, Director of the Federal Statistical Bureau, and adopted.

August 14, there was a debate on the report of the Committee on the initial meridian and the universal hour. It was finally decided by a unanimous vote to refer the question to delegates of the Powers, to meet at Berne. Resolutions were also adopted concerning the advice and information to be furnished to emigrants, and the new method of geographical instruction.

It was proposed to hold the next Congress at Genoa, on account of the Centenary of Columbus; but, after discussion London was selected as the place, if the decision met the views of the Royal Geographical Society. On the proposition of General Annenkoff, the Congress voted that all the Societies be invited to send delegates to take part in the celebration of the Columbus Centenary at Genoa. The president, M. Gobat, then offered to General Annenkoff, in recognition of his great achievement of the Transcaspian Railway, the diploma of Honorary Membership in the Geographical Society of Berne; a fitting close to the deliberations of the Congress.

Of eighteen resolutions voted by the Congress, M. de Claparède in the *Journal de Genève*, of August 22, notes several which must be, as he thinks, fruitful in good results.

First of these is the decision with regard to a map of the world, on a scale of one-millionth, the sections to be limited by the meridians and the parallels. The commission on this map is constituted as follows: Germany, Dr. Supan of Gotha; Baron von Richthofen, Berlin; Austria-Hungary, Gen. von Arbter, Director of the Im-

perial Geographical Institute, and Prof. Penck; Spain, Col. Coello; France, M. Maunoir and M. F. Schrader; United States, Maj. Powell and Prof. Mendenhall; Great Britain, Gen. J. T. Walker, Sir Charles Wilson, Mr. E. G. Ravenstein, and Mr. Scott Keltie; Italy, Prof. Guido Cora and Gen. Ferrero; Portugal, Prof. Cordeiro; Netherlands, M. Eckstein; Russia, Gen. von Tillo; Sweden, Maj. Selander; Switzerland, Col. Lochmann.

The second is the creation of an International Committee to draw up a list of questions, the answers to which shall furnish particular information with respect to colonies and the little known regions to which emigration is directed.

The third is Resolution No. 4, by which the Congress passed upon a question of fact, all the more urgent that it was of a somewhat delicate nature, in adopting the unanimous report of the Special Committee adverse to Capt. Willard Glazier's claim to be the discoverer of the source of the Mississippi.

The fourth is Resolution No. 5, on the subject of the Initial Meridian and the Universal Hour. By this Resolution the Congress gave expression to its desire that the "Swiss Federal Council, acting in concert with the Italian Government, which has lately taken the initiative, invite the other Governments to expedite the study of the questions of the initial meridian and the universal hour, as well as that of the utility of horary gores in international relations and in public life, and the assembling of a Committee of delegates, *provided with full powers*, to regulate *once for all* these various questions."

M. de Claparède says very truly that it is a matter of secondary importance, whether the meridian selected be that of Bering, or Ferro, or Greenwich, or Paris, or Rome, or Jerusalem. It is essential only to have one universally accepted meridian.

Fifth comes the Resolution (No. 7) by which the Congress recommends the alpine botanical garden *Linnæa* to the good-will of all geographical Societies.

The sixth place is held by the Resolution No. 8, which calls upon the Geographical Societies to use their influence for the establishment of special Chairs of Geography in the academies and universities.

An Interesting Speculation.—Mr. E. G. Ravenstein contributed to the *Proceedings* of the Royal Geographical Society for January, 1891, an article on the "Lands of the Globe still available for European Settlement."

In this most instructive paper, Mr. Ravenstein showed that the increase of population in a decade was, for Europe, 8.7 per cent., for Asia, 6 per cent., for Africa, 10 per cent., for Australasia, 30 per cent., for North America, 20 per cent., for South America, 15 per cent.; and for the whole earth, 8 per cent. He put the present population of the earth at 1,468 millions. "By the close of this century," he said, "the 1,468 millions who now dwell upon the earth will have increased to 1,587 millions; in the year 1950 there will be 2,332 millions; in the year 2000, 3,426 millions; and in the year 2072, or 182 years hence, there will be be 5,977 millions. These estimates are not presented as a prophecy."

They sound, however, like the first notes of the last

trumpet, for Mr. Ravenstein elsewhere says: "I therefore assume that this world of ours, if brought fully into cultivation, can supply 5,994 million human beings with food and other necessary products of the vegetable kingdom."

Clearly, something must be done by those who feel their responsibility to these ghostly millions of the year 2100, and M. Paul Leroy-Beaulieu is the first to come to the rescue. In two articles on *The Influence of Civilization on the Movement of Population*, translated in the *Journal* of the Royal Statistical Society for June, 1891, M. Leroy-Beaulieu notices Mr. Ravenstein's paper and presents some objections to its argument:

"Mr. Ravenstein," he says, "exaggerates the nourishing capabilities of the globe in assuming that agricultural science will remain in its present condition. It is very doubtful that the earth will be able to feed, cultivated as is the greater part of the European soil, the 5,994 millions whose existence is anticipated by Mr. Ravenstein in one hundred and eighty-two years' time, that is, in the year 2072. But, on the other hand, it is certain that the rate of increase of 8 per cent. in ten years in the numbers of the population, even supposing it to be an accurate one (and for the generality of the world it can only be a hypothetical one), cannot be maintained indefinitely. We have shown that the degree of civilization, or rather the special rate of European civilization, tends to diminish it."

In making his demonstration, M. Leroy-Beaulieu cited the well-known case of France, where the birth-rate fell from 25.4 per 1000 for the period 1870–1880 to 23.4 in the year 1888; but he added that all other civil-

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ized nations appeared to be tending in the same direction.

In Austria and in Hungary the birth-rate was the same in 1882 or 1883 as in 1865, but in Italy it fell from 38.3 to 36.9; in Prussia it fell from 39.1 to 36.3; in the Netherlands from 35.9 to 35.1; in Switzerland from 35.5 to 32.5, in Belgium from 31.4 to 30.5, in England from 35.5 to 33.7, and in Scotland and Ireland the birth-rate fell to the same level as the French, namely, from 24.9 to 23.6 per 1000.

His conclusion is that what it has been agreed to call civilization, which is really the development of material ease, of education, of equality, and of aspirations to rise and to succeed in life, has undoubtedly conduced to a diminution of the birth-rate.

He believes it to be impossible to determine the number of inhabitants that the earth will feed; but he regards it as certain that, in a very short time, in fifty or sixty years, and possibly in thirty or forty, when the New World has doubled or trebled the number of its inhabitants, a very decided rise in prices will be experienced in the Old World.

This period of sixty years will bring us to the year 1950, when the population of the United States will number, according to Prof. H. S. Pritchett (*Quarterly Publications of the American Statistical Association, June, 1891*), not less than 190,740,000. Prof. Pritchett's "Formula for predicting the Population of the United States" betrays no sign of the faint-heartedness, which marks Mr. Ravenstein's calculation. The 190,740,000 inhabitants of these United States, in 1950, will have increased, in the year 2100, to 1,112,867,000; in the

year 2500, to 11,856,302,000; and in the year 2900, to 40,852,273,000. Fortunately for mankind, the formula ceases working at this point.

THE BRITISH ASSOCIATION AT CARDIFF.—The following note on some of the proceedings in the Section of Geography of the British Association is made almost without change from the reports in the London *Times*:

Dr. Robert W. Felkin read a paper on "Acclimatization." He said that on that subject there were two schools of thought—the one regarding acclimatization as impossible, the other more sanguine and pronouncing it possible. Probably the truth would be found to be a mean between the two. In reference to Europeans becoming acclimatized in the tropics, those factors which prevent it were heat, cold, damp, various endemic diseases, especially malaria, and those constitutional conditions induced by climate which either destroy the immigrants or diminish their fertility after one or two generations. Progress has been made during recent years in enabling persons to reside longer and to enjoy greater health in the tropics.

Colonel Sir Francis de Winton said life in the tropics was possible under certain simple rules—(1) a young man should not go there till the constitution was set, say 24 or 25; (2) he should be careful in clothing; (3) temperate in all things—living simply, but well; (4) always have work—the mind should be constantly employed—not overwork, and a certain amount of amusement.

Miss Clarke read her paper on "The Aborigines of Western Australia." She said: The monastic settlement of New Norcia, 70 miles from Perth, in Western Australia, is the most striking refutation of the generally received belief in the irredeemable degradation of the Australian aborigines. Founded in 1846 by two Spanish Benedictines, Fathers Serra and Salvado, who gradually won the confidence of the natives by sharing their pursuits, it now forms a flourishing industrial colony, consisting of a monastery, church and schools, surrounded by a vast cultivated domain, workshops for different trades, and a native village of about 50 cottages inhabited by as many Christian families. One of the girls trained here is in receipt of a Government salary as head of the post and telegraph office, in which, when absent on sick leave, she was efficiently replaced on short notice by one of her companions. The boys, too, learn with great facility, and many of them prove steady tradesmen or trustworthy servants and foremen. In the wild state these aborigines are cannibals who devour

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the flesh of their own kinsfolk and exhume for food bodies after three days' burial. They believe in an omnipotent creator and an evil principle, but do not propitiate either by worship; they regard the moon as maleficent, the sun as a benefactor, and the stars as a numerous family sprung from the marriage of several couples amongst them. The soul is believed to survive after death in a disembodied state, and to transmigrate into the body of others, remaining in that of the last of the party who approach to invite it. They are grouped in families of ten or twelve, under the absolute rule of the head, but no longer, as formerly, form tribes by the agglomeration of these families. The men are prohibited from marriage before the age of 30, have often but one wife, sometimes two, and a larger number only when they adopt those of relatives or friends left otherwise unprotected. Defective infants and superfluous girls are killed, but the others are reared with great tenderness, which is also exhibited to aged parents.

Miss Clarke missed a great opportunity by failing to recommend the killing of *superfluous* girls in civilized countries. Are Europeans less tender-hearted than West Australians?

Colonel Holdich then read his paper on "The Application of Indian Geographical Survey Methods in Africa." Colonel Holdich said: These surveys may be assumed to be of a geographical rather than a revenue class, and to have in view objects similar to those obtained by the geographical surveys carried out by Indian survey officers. An outline of the methods proposed may be summarized as (1) the adoption of a rapid system of triangulation along the most important lines for first survey; (2) the extension of a graphic system of mapping from these lines by means chiefly of native labor. The most important lines for first survey are the international boundary lines. There is a great necessity for a topographical acquaintance with the boundaries adopted. Only a small portion of them apparently follow permanent natural features, the rest being defined by rivers, etc., which are dangerous and uncertain. It would appear, then, advantageous to commence triangulation along the boundary lines. This is a national or international question, and State assistance might very well be expected and Imperial resources drawn upon for carrying it out. He then asked, (1) What are these resources? (2) What is the nature of surveys already existing in Africa? (3) What is the nature of the survey we ought to build up? Replying to 2 and 3 we find that if a continuous and comprehensive scheme is to be adopted, with unity of design for all the scattered districts of the African colonial system, nothing has very much been done as yet which would assist us in

carrying out our scheme. This scheme should be largely borrowed from experiences in Asia. A consideration of it shows (in reply to 1) to what extent Imperial survey resources might be utilized during the processes of laying out the preliminary lines of triangulation. Then followed a short consideration of the general topographical processes as carried out by natives of India, of the value of such native labor, and of the possibility of raising survey establishments in Africa similar to those which have done such excellent work in Asia.

Mr. Meakin read a paper on "Morocco as a Field for Geographers." Only a small portion of the country is at all fairly known, and on the whole it may be considered, not only for the geographer, but for all scientists, as virgin soil. Only one traveller has explored the famous Atlas to any extent and given to the world satisfactory maps and other topographical *data*. This is the Baron de Foucauld, who travelled some years ago in the disguise of a Jewish Rabbi. The failure of all others who have attempted this task has been due to their unsuitability, chiefly arising from their ignorance of the people and the language. Rohlfs penetrated as far as de Foucauld, on the whole, but had no means of preserving a scientific record. To explore the Atlas abundant adaptability is needful, an intimate acquaintance with the people indispensable, and, as a rule, native costume is imperative. A satisfactory *raison d'être* must always be placed before those whose territory is visited. The only authority with regard to the flora and geology of any portion of the highlands is derived from an excursion of Messrs. Hooker and Ball for a short distance beyond Marrákesh (Morocco city). Some of the Christian slaves of bygone centuries have left us valuable itineraries, but the sum of all that has been accomplished is, after all, very meagre. Many have posed in England as explorers who have merely enjoyed an extended picnic in easily accessible parts. There is consequently no reliable map of Morocco, the only real attempt having been made by Captain Baudouin for the French War Office, in 1848. This is compiled partly from actual observation and the records of travellers, but for the most part depends on the vague information of natives. The configuration of the Atlas is considerably different from that shown on most maps. Instead of one long chain stretching in a south-westerly direction, it is in reality composed of three more or less parallel lines, which are best defined as the Medium, the Great, and the Lesser Atlas, the first-named being the northernmost and the last bordering on the Sahara. Of these only the centre of the Great Atlas has been to any extent explored. With the exception of its northern extremity towards Fez, the Medium Atlas and that portion of the Great Atlas which lies south of it are quite a *terra incognita*. De Foucauld and Rohlfs have skirted the

Lesser chain, and the whole have been crossed at a number of points, though nothing much is known. It is a spur of the Great Atlas which runs off west to Cape Ghir, and this has been crossed many times. The rivers of the south side of the Atlas are mostly swallowed up in the sands of the Sahara after forming fertile oases, while those of the north water the rich alluvial plains of Morocco proper. The perpetual snows of the Great Atlas furnish an abundant supply in the hottest weather, and this mighty back-bone shields the whole country from those desert winds which make the summer of Algeria unbearable. Even the rude operations of the natives have sufficed to prove the richness of this range in valuable minerals. Wild beasts are few, and dangerous ones almost extinct. These mountains are the home of the Morocco Berbers, who offer a most interesting field for scientific research. In a paper to be read before the Anthropological Section of this gathering the writer has endeavored to give a brief sketch of this little known people. They are, however, not the only inducement to further exploration, for very little is known of the troglodyte dwellings which line the mountain sides, and as little of the many ruins left by some former occupiers, ascribed either to Christians or the Romans. Then, too, there is much to be learnt about the Jews who live among the Berbers, as distinct as Jews could be from those who haunt the plains.

Lord Lamington read a paper on his visit to the Shan States on the Siam border. The paper dealt with his journey from Chieng Mai, in the Laos country, to Mung Phoong, in the Sibsong Pana. Starting with Mr. Archer, our Consul at Chieng Mai, he described the country as far as the Meh Teng, a river that flows into the Meh Ping, as being already very productive, and considered that it only required opening up by improved means of communication, an increase of population, and security of property to develop into one of the richest territories. On leaving the Meh Teng they passed over a watershed into the valley of the Meh Hang, an affluent of the Salween. The frontier of our Shan States with Siam lies somewhere in this region, but it has not been yet defined. Arriving at Mung Tuen, they met the British party that came from Burmah to take part in the Anglo-Siamese Boundary Commission. From this place he described a visit to the great cave which the river Meh Hang enters and tunnels its way under a range of hills. He then narrated the journey of the Commission to Mung Sat, and thence down Meh Khok river by a path through the jungle which presented great difficulties from its not having been used for years. For more than three weeks they had seen no habitation, those villages they did pass all having been destroyed. It is the constant petty wars of aggression between the various States that make it an intricate task to settle who has

the rightful claim to any particular district. Leaving the Meh Khok some two days' journey above its junction with the Meh Kong, the Commission crossed over a watershed into the plain of Chieng Sen, which is reckoned as over 100 miles long, and of an average breadth of ten miles. This was a welcome change to the party after spending weeks of hard travelling amongst hills, and who, owing to the dense jungle, were never able to obtain a distinct view. He described the plain as being of great fertility with the capacity for further development. At Hongluk, a Shan village at the northerly end of the plain, he left the Commission and travelled alone on his way to Tonquin. Four days' travelling brought him to the river Meh Kong by the village of Kyang Lap. The channel of the river between the banks he considered to be 600 yards broad, but as it was the dry season, the actual breadth of water was only 120 yards, though very deep. A few more days' travelling took him to Mung Sing, the capital of Kyang Kheng, which, though only five years established, shows every sign of being an important place. It is situated in a large plain, well populated, with a series of fertile valleys stretching almost the whole way to the Meh Kong. He dwelt on the possibilities of the great agricultural wealth that could be developed in the State of Kyang Kheng as an argument for urging the Indian Government not to be afraid of accepting the position of being the suzerain Power. The State was hitherto tributary to Kyang Tung, which came under our protection as one of the States of the old kingdom of Ava. But the Tsawbwa of Kyang Kheng, annoyed at his nephew being made Tsawbwa of Kyang Tung, withdrew his allegiance, and placed his State under the protection of Nan, a northern frontier State of Siam. Lord Lamington went on to say that after he had been there the Commission paid a visit to Mung Sing and found the Tsawbwa quite ready to return to his old and proper allegiance. This was most important, as then any railway made up the valley of the Meh Kong would of necessity pass through British territory. A railway to the plain of Chieng Sen was, on Mr. Holt Hallett's showing, sure to be constructed some day, and then the prolongation of it into the rich district of the Sibsong Pana and Yunnan would rest in the hands of the British.

It is to be regretted that Lord Lamington says nothing of the arguments that worked with the repentant Tsawbwa. They were possibly not unfamiliar to the British Association, but their statement would have a certain value.

Mrs. French Sheldon read a paper entitled "A Visit to Kilima-Njaro and Lake Chala." She had no thought of geographical exploration.

Her plan had been to study native habits and customs free from the influence of civilization and in their primitive condition. She started on her journey without companionship or the assistance of a lieutenant, and not even with a doctor. The expedition of 130 men was personally directed, disciplined, and led by herself. Her English stewardess was taken seriously ill, and the expedition had to carry her for three-fourths of the distance in a most dangerous condition. The majority of her caravan party were untrained and unreliable, and until she gained complete mastery over them there was a disposition to be rebellious. The hazard, however, was taken with eyes open, and the responsibility was incurred in order that a portion of the country should be visited which was solely inhabited by natives who had never seen the face of white men or women. She received before starting many hints from men like Mr. Stanley and other travellers. She had, besides, read most of the books on the subject. Within a week from the time she reached Zanzibar her caravan was organized. She had expected and counted on hardships in giving up her home, but she did not expect to have had, day after day, in the solitude of the desert, to contend with new difficulties which arose, and to overcome which almost needed more than human aid. There was nothing left to her to but to gain absolute control over her men. This could only be done by an application of the rawhide whip. She often lay awake at night trying to decide what would be the best thing to do. Had she consulted her own first impulses she would have shot more than once every man in the caravan. She found, however, that a certain degree of patience had to be cultivated, and when punishment had to be meted out it was necessary to wait patiently for the execution of orders. This delay was one of the most difficult things she had to contend against, because of her impatience to have her orders executed. The hardship entailed by the climate was also very great. The rains had begun to fall, and when marching she and her party were frequently up to the armpits in water or half sunk in marshes. It was interesting to observe that the natives, instead of taking to flight on the approach of her party and deserting the caravan paths, came down to meet her. By some system of communication all the tribes seemed to know of her approach, and it afforded her no little amusement to hear the native men and women describe her in their own language as "woman master." They seemed not to be able to comprehend the position of a woman in charge of a caravan ; but, instead of showing her rudeness, the natives from one coast to the other, on routes which passed through savage and wild districts, showed nothing but deference and homage.

She therefore thought that a great deal depended, not on the fact as

to whether women or men went among these people, but on the manner in which they went and how they conducted themselves. If travellers acted in a manly and straightforward manner and kept their word of honour inviolable no difficulty was found. It was the person who promised and never fulfilled who got into difficulty, and then the natives got into the habit of thinking that the white man was the biggest liar in existence, with the result that antagonism was engendered and Europeans were paid back in their own coin. Without egotism she might say that the natives treated her not only with homage but as if she were a potentate. She frequently received as many as ten oxen as a mark of homage, and the chiefs would frequently send messengers and couriers ahead in order to find out whether she intended to pass through their territory either going or returning. But she went straight ahead to Kilima-Njaro. Sometimes the natives reconnoitred her approach, and held aloof. On those occasions she went frankly towards them with extended hands containing some bright attractive offering as a present. She went into Africa with all delicacy and womanliness, but quite prepared to accept things as they were there. On one occasion a band of warriors appeared at her camp in an entire state of nudity. Next day, however, they reappeared clothed as her own followers were, thereby showing that they had divined that their original state was distasteful to her. She had been invited by both the men and women of tribes to attend their marriage feasts, dances, and funeral services, which was a very rare experience for any one outside the tribe to enjoy. On the 26th of April she started with a portion of her caravan to visit Lake Chala, near Kilima-Njaro. Descent to the lake could only be obtained by sliding down the rocks, crawling over prostrate trees, forcing a way through primitive forests, and swinging from tree to tree like monkeys. When she reached the bottom of the cliffs surrounding the lake she thought that it was the most sacred looking place she had ever seen. Owing to the overhanging cliffs and the strange murmur of the water the situation was weird in the extreme. She felt herself to be in a state of tremor and marvelled at the curious aspect of the waves on the face of the lake. She also puzzled very much over the origin of those waves, and whether or not there was a current to cause them, but there was neither inlet nor outlet in the lake to account for them. A kind of raft was constructed and the lake was circumnavigated. She was astonished at having to make constant *détours* into various little bays, and her original estimate of the size of the lake, owing to the time taken in the journey, was eight miles round. But this would now be modified into a distance of six miles, a figure which approached more nearly scientific accuracy. The under-currents in the lake were very difficult to overcome, so much so that they were

compelled to keep the boat near the shore. By means of a plummet the bottom of the lake was touched at one point at fifty yards' depth. In her return journey she met with an unfortunate accident. While being carried in a palanquin across a swollen torrent the porters stumbled, and she was thrown from a height of 30 or 40 feet. She was dropped by her carriers a second time, and injury to her spine was the result.

Sir Francis De Winton, speaking with an intimate knowledge of the many difficulties which attended caravan travelling, stated that the sufferings and difficulties undergone by Mrs. Sheldon in order to carry out her object testified to her great courage and devotion. When he heard originally of the intended expedition he had many misgivings as to its probable success, because Mrs. Sheldon chose the worst time of the year for her journey—the beginning of the rainy season. He was glad to hear of the patience displayed by Mrs. Sheldon in her dealings with the porters because it ought to be recognized by intending travellers in tropical Africa that nothing but patience would succeed with the natives. He further thought that Mrs. Sheldon's lecture showed that she was possessed of careful and accurate powers of observation, and he trusted her observations would be of great use to those who might follow in her footsteps.

Surgeon-Major Ince thought that Mrs. Sheldon had set an example to future African explorers as to the true manner in which the natives should be approached.

Mrs. French-Sheldon's methods have simplicity and directness. Even a Zanzibari can understand discipline in the shape of a raw-hide whip applied to his back, but is it quite sure that he appreciated the patience displayed by his *woman master* between floggings? It is something to have the approval of Sir Francis De Winton and Surgeon-Major Ince, but the Zanzibaris must have had a sharp sense of the lady's confessed impatience to be up and at them, with her more than human aid. It is natural, perhaps, but strange that Mrs. Sheldon seems to feel no remorse for having introduced into the native Paradise the contaminating idea of clothes, the livery of a degraded civilization, from which "her own thought drove her like a goad" to primitive habits and customs.

Dr. Henry Schlichter read a paper on "The Geography of South-West Africa." He said that South-West Africa was in many respects only imperfectly known to geographers. Our information about Great Namaqualand, the western Kalahari, the large Kaoko district, and the belt between the the Atlantic Ocean and the highlands of the interior was by no means satisfactory. Since Germany had acquired territories in South-West Africa many scientific and other travellers had traversed the German sphere of influence, and thereby contributed to our knowledge of the country. But geographical science had not yet gained much by these recent German explorations, for, with the exception of a few books and scientific publications, all the information had reached the public and been preserved only in various German papers and periodicals, mixed with many more or less unimportant colonial matters. Moreover, the old explorations of South-West Africa needed a revision. Mr. Theal, who had searched the archives of the Cape Colony, had recently discovered that the Orange River was known before Gordon reached it in 1777, and that in 1761–62 a well-equipped expedition penetrated into the interior of Namaqualand, much farther north than Paterson, Gordon, and other travellers did. In 1791–92 a second exploring party reached a point still further north. But these interesting journeys were soon afterwards forgotten. The British Museum contained the full diary (printed in Amsterdam, 1778) of the first of these expeditions, and as Mr. Theal had given only short reports, without going into geographical details, he had examined this diary and compared it with the literature of the present and the last century. He found that this old expedition was of considerable importance for our knowledge of South-West Africa. The object of the author in this paper, therefore, was to collect and criticise the new and old reports unknown to geographers and to give a correct account of the present state of the geography of South-West Africa.

Mrs. Bishop (Miss Isabella L. Bird) gave an account of her visit to the Bakhtiari country. Her route lay through Ispahan and up the country to Khur Amabad. Some people looked forward to the occupation of South-West Persia on the part of England at an early date, and those people considered that the Bakhtiaris, who were excellent horsemen, might soon be made use of by England in that occupation. In view of such an eventuality, interest was felt in the Bakhtiaris, their numbers, and their proximity to South-West Persia. She made references to a map, which described an area of 15,000 square miles in the 31 deg. to 34 deg. north latitude, and 48 deg. to 51 deg. east longitude. The distance she actually travelled was over 700 miles. She could not agree that the people of the Bakhtiari country were savages. In the first place they had that mark

of true civilization, that both sexes were clothed in Manchester cottons. They showed reverence for old age and respect for infancy, which were not found in other savage tribes. In the four months she spent amongst them no one offered any personal rudeness. No man of the Bakhtiaris ever lifted the curtain of her tent. They were a pleasant people, and it was easy to move amongst them. The safety of the traveller in the Bakhtiari country depended upon his observance of Bakhtiarian custom and his not violating it where it was possible to avoid doing so. Her part of the expedition consisted of herself, an interpreter, a cook, and two muleteers. She rode on horseback, and they were obliged to take four mules owing to the necessity for carrying all provisions for 40 days, except meat. The party altogether numbered 18 men, of which two only were Europeans, with 20 mules and a few horses. With that party she travelled through that very wild country without any serious disaster. Travel was comparatively easy in the Bakhtiarian country proper, but on reaching beyond the outside range of the influence of two English officers who had preceded her in those parts the people were suspicious, and the party were fired upon twice by a number of tribesmen, but no one was injured. She started for Ispahan on April 30 last year, and the first stage of the journey was through a desert with 300 villages, each village an oasis, each oasis a paradise. On elevated plains, at an altitude of 6,000 ft., they found remains of Armenian villages and Armenian graveyards, showing that probably in centuries long past Christianity was professed by a far larger number of people in the country than at present. On her journey she experienced the cleverness of Bakhtiarian thieves and the celerity of Bakhtiarian justice. In a village she was robbed of all her money, being left absolutely penniless, but in a few days she was repaid the full amount by the local Cadi, who had levied it upon the village where the robbery took place. The thief was liable to have his right or left hand cut off, and the decision of which it should be was referred to her. She described the journey in search of the source of the Karun River. The sinuosities of the river were so extraordinary that in the country from its source to Shuster, a distance of 75 miles, the river's windings reached to 260 miles. In the same course it descended 900 ft. and received many tributaries, which increased its power and velocity In one place coal was found in abundance; it burned well, but there was much bituminous smoke. Bituminous limestone abounded, and bituminous springs. She heard of deposits of sulphur, with which the natives made their gunpowder, but she did not see them. The climate, though it had extremes, was very healthy. They found traces of well-built stone bridges and well-constructed roads, which must have been trodden by the soldiers of Alexander the Great and Valerian, though the natives

attributed them and other similar works to supernatural agency in the mythical past. After an interesting account of the agriculture of the country, she said her chief interest was in the Bakhtiaris themselves, and a medicine chest she took with her, together with minor surgical operations, which she undertook, helped her materially in her observance of the native character and customs. Though as Moslems the Bakhtiaris despise women, women act as their doctors. The diseases of the natives were rheumatism, dyspepsia, headache, epilepsy, affections of the eyes, and a simple skin disease caused by want of personal cleanliness. Blood feuds were marked features. Polygamy is the custom of the country, and no female servants were allowed who were not also wives of the man of the house. A Bakhtiari man, therefore, married as many women as he could support, but the women were unveiled and had perfect freedom. However savage intertribal wars might be, the women were always safe. The author devoted some time to detailing the religious beliefs of the Bakhtiaris, which included the idea of a Supreme Being and an intercessor, Heaven and Hell, with a future probation beyond this life which might terminate happily, and a final judgment day. Sin they define as cowardice, breaches of the Seventh Commandment as offenses against tribal interests. They had some idea of the unity of God, but none of the fatherhood of God, the brotherhood of man.

Lord Aberdare moved a vote of thanks to Mrs. Bishop, and referred to the interest that had been taken in this people by Sir H. Layard.

Professor Max Müller seconded the motion, and remarked that this department had obtained a most valuable paper that properly belonged to anthropology.

Mrs. Bishop forgot in her interesting address, and neither Lord Aberdare nor Mr. Max Müller reminded her of the omission, to say which of his hands the Bakhtiari thief was condemned to lose by her decision. She is a great traveller, who has seen the cities and the ways of many men, and she has had the opportunity to observe that even the uncivilized have a respect for justice, when tempered with mercy. By the law of his people the thief deserved to lose his hand; and anthropology, if not geography, waits in suspense to know how the case was decided. Was the left hand cut off, or the

right? A Bakhtiari has but two hands, and this must have complicated the question for a civilized woman, naturally reluctant to order the mutilation of a poor fellow to whom the brotherhood of man and the fatherhood of God were unknown ideas.

PILOT CHART FOR SEPTEMBER.—The U. S. Hydrographic Office had received, up to September 1, incomplete data respecting the hurricane of August 18, at Martinique. So far as known, the loss of life was 378, and property to the amount of $10,000,000 was destroyed. The storm passed WNW. toward Santo Domingo. Brief reports indicate that it recurved over the eastern Bahamas, and thence moved NE., close to Bermuda, where, at noon of the 27th, the wind blew with hurricane force from NNW., and the barometer fell to 29.44.

September is one of the most dangerous hurricane months, and the Pilot Chart calls attention to the following information:

"SEASON AND REGION.—Hurricanes are especially liable to be encountered from July to October, inclusive, in the tropics (north of the 10th parallel), the Gulf of Mexico, and Gulf Stream region. Earliest indications: Barometer above the normal, with cool, very clear, pleasant weather; a long, low, ocean swell from the direction of the distant storm; light, feathery cirrus clouds, radiating from a point on the horizon where a whitish arc indicates the bearing of the centre. Unmistakable signs: Falling barometer; halos about the sun and moon; increasing ocean swell; hot, moist weather, with light, variable winds; deep red and violet tints at dawn and

sunset; a heavy, mountainous cloud bank on the distant horizon; barometer falling more rapidly, with passing rain squalls.

"CYCLONIC CIRCULATION.—One of the most important indications that an approaching storm is of hurricane violence is the marked cyclonic circulation of the wind, lower and upper clouds, etc. This may be easily appreciated by remembering that a cyclone of any great intensity is an ascending spiral whirl, with a rotary motion (in the Northern Hemisphere) against the hands of a watch, as shown on the diagrams. The surface wind, therefore, blows spirally inward (*not* circularly, except very near the centre); the next upper current (carrying the low scud and rain clouds), in almost an exact circle about the centre; the next higher current (the high cumulus) in an outward spiral—and so on, up to the highest cirrus clouds, which radiate directly outward. The angle of divergence between the successive currents is almost exactly two points of the compass. Ordinarily, with a surface wind from N., for instance, the low clouds come from N., also; on the edge of a hurricane, however, they come from NNE., *invariably*. In rear of a hurricane the wind blows more nearly inward; with a SE. wind, for instance, the centre will bear about W., the low clouds coming from SSE. (two points to the right of the wind). Great activity of movement of the upper clouds, while the storm is still distant, indicates that the hurricane is of great violence. If the cirrus plumes that radiate from the distant storm are faint and opalescent in tint, fading gradually behind a slowly thickening haze or veil, the approaching storm is an old one, of large area; if of snowy whiteness, projected

against a clear blue sky, it is a young cyclone of small area but great intensity.

"INTENSIFIED TRADE-WIND BELT.—Another very important fact may be stated thus: When a hurricane is moving along the equatorial limits of a trade-wind region there is a belt of intensified trades to windward of its track; not until the barometer has fallen about six-tenths of an inch is it safe to assume that, because the trade-wind increases in force and remains steady in direction, you are on the track of the storm. By attempting too early to cross its track, running free as soon as the wind begins to freshen, you are liable to plunge directly into the vortex.

"THE BEARING OF THE CENTRE OF A HURRICANE.—The 8-point rule, it should be understood, gives only an approximate idea of the bearing of the centre, and it is probably less reliable in the dangerous than in the navigable semi-circle. The best general rule is that *the centre bears about eight points to the right of the direction from which the low clouds come*, or, what is practically the same thing, *eight points to the right of the wind at the moment of a sudden shift in a heavy squall;* after such a shift the wind will remain steady in direction for a time, but the centre is meanwhile moving along and the angle of bearing changes until the next shift, when it becomes eight points again."

LIGHT-HOUSES OF THE WORLD.—In a Report on the Modern Light-house Service, prepared by Mr. Arnold Burgess Johnson, Chief Clerk of the U. S. Light-House Board, appears the following statement, made up from the British Admiralty Lists, and collated to the year

1890 from statements then from one to five years old :

There were in Europe 3,309 lights, distributed as folfollows : Great Britain and Ireland 817, France 444, Sweden 295, Italy 244, Norway 220, Spain 187, Germany 179, Turkey 168, Netherlands 166, Russia 154, Denmark (6 in Iceland) 132, Black Sea (Russia and Turkey) 88, Portugal 29, Belgium 18.

Is it to be understood that the countries omitted, such as Austria-Hungary, Greece and Romania, were unprovided with lights in 1890? The figures foot up 3,141, instead of 3309.

There were 1,329 lights in North America :

The United States 802, Dominion of Canada 443, Newfoundland 51, Mexico 15, British Honduras 7, Costa Rica, Honduras and Salvador each 3, Nicaragua and Guatemala, each 1.

South America had 167 :

Brazil 65, Chile 21, Uruguay 16, Argentina 12, Colombia 10, Venezuela 10, Peru 10, Ecuador 9, British Guiana 6, French Guiana 5, Dutch Guiana 3.

The West Indies had 106 :

The Windward Islands 44, Cuba, 21, Leeward Islands 18, Bahama Islands 15, Curaçao, Buen Ayre and Oruba 6, Bermuda 2.

In Asia there were 476 :

China 81, Hindustan 78, Eastern Archipelago 75, Japan 67, Bay of Bengal 30, Straits of Malacca 29, Asiatic Turkey and Syria 28, Philippine Islands 26, Red Sea 15, Gulf of Tartary 14, Ceylon 10, Gulf of Aden 7 Gulf of Suez 7, Siam 2, Corea 1.

There were in Africa 219 lights :

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Algeria 48, West and South Coasts 44, Egypt 26, East Coast 25, Canary Islands 13, Cape Verde Islands 12, Tunis 12, Morocco 6, Tripoli 5, Réunion 5, Azores 4, Mauritius 4, Madagascar 4, Zanzibar 4, Comoro Islands 3, Madeira 2, Seychelles 2.

In Oceania the number was 319:

Australia 203, New Zealand 79, Tasmania 12, Hawaiian Islands 8, Fiji Islands 8, Society Islands 3, Samoa and Friendly Islands 3, New Caledonia 2, and Caroline Islands 1.

The total number of lights for the world is 5,925; or, allowing for later additions, about 6,000.

TOPOGRAPHICAL ATLAS OF THE UNITED STATES.—Mr. J. H. Hickox announces in his *Catalogue of U. S. Government Publications, Vol. VII, Nos. 2–5*, that this indispensable periodical, created and sustained by his unaided efforts, will be continued. From this last issue is taken the following list of the Topographical Atlas sheets published during the past year:

UNITED STATES GEOLOGICAL SURVEY.

INTERIOR DEPARTMENT.

Note.—The Geological Survey publishes a map of the United States. (*See* below.) The Survey is also constructing an atlas of the United States from new surveys. Each State is divided by parallels and meridians into sections, and a sheet (about 14 by 17½ inches) covers either a square quarter degree or a sixteenth of a square degree. This division is made without regard to State or county boundaries. Thus it happens that one sheet will sometimes cover portions of two or even three States. A sheet is named from some prominent feature shown upon it. Most of them are on a scale of 1:62,500, or about one mile to one inch; or on a scale of 1:125,000, or about two miles to one inch. Those on the former scale cover 1-16 of a square degree; those on the latter, ¼ of a square degree. Relief is shown by contours. The contour interval varies from 5 to 100 feet, according to scale and character of country. The surveys already completed are: New Jersey, 50 sheets; Massachusetts, 54 sheets; Rhode Island, 15 sheets; Connecticut, 34 sheets. The following sheets have been completed during the year ended June 30, 1891:

ALABAMA.

ASHLAND. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 33° 0′; longitude of eastern border 85° 30′.

CLANTON. Scale 1:125,000; contour interval 50 ft. Latitude of southern border 32° 30′; longitude of eastern border 86° 30′.

ARKANSAS.

MAGAZINE, MT. Scale 1:125,000; contour interval 50 ft. Latitude of southern border 35° 0′; longitude of eastern border 93° 30′.

MARSHALL. Scale 1:125,000; contour interval 50 ft. Latitude of southern border 35° 30′; longitude of eastern border 92° 30′.

MARRILTON. Scale 1:125,000; contour interval 50 ft. Latitude of southern border 35° 0′; longitude of eastern border 92° 30′.

MOUNT IDA. Scale 1:125,000; contour interval 50 ft. Latitude of southern border 34° 30′; longitude of eastern border 93° 30′.

MOUNTAIN VIEW. Scale 1:125,000; contour interval 50 ft. Latitude of southern border 35° 30′; longitude of eastern border 92° 0′.

CALIFORNIA.

COLFAX. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 39° 0′; longitude of eastern border 120° 30′.

PLACERVILLE. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 38° 30′; longitude of eastern border 120° 30′.

COLORADO.

APISHAPA. Scale 1:125,000; contour interval 25 ft. Latitude of southern border 37° 30′; longitude of eastern border 104° 0′.

AROYA. Scale 1:125,000; contour interval 25 ft. Latitude of southern border 38° 30′; longitude of eastern border 103° 0′.

CATLIN. Scale 1:125,000; contour interval 25 ft. Latitude of southern border 38° 0′; longitude of eastern border 103° 30′.

HIGBEE. Scale 1:125,000; contour interval 25 and 50 ft. Latitude of southern border 37° 30′; longitude of eastern border 103° 0′.

LAS ANIMAS. Scale 1:125,000; contour interval 25 ft. Latitude of southern border 38° 0′; longitude of eastern border 103° 0′.

NEPESTA. Scale 1:125,000; contour interval 25 ft. Latitude of southern border 38° 0′; longitude of eastern border 104° 0′.

PUEBLO. Scale 1:125,000; contour interval 25, 50 and 100 ft. Latitude of southern border 38° 0′; longitude of eastern border 104° 30′.

SANBORN. Scale 1:125,000; contour interval 25 ft. Latitude of southern border 38° 30′; longitude of eastern border 103° 30′.

SUFFOLK. Scale 1:125,000; contour interval 25 ft. Latitude of southern border 38° 30′; longitude of eastern border 104° 0′.

TIMPAS. Scale 1:125,000; contour interval 25 and 50 ft. Latitude of southern border 37° 30′; longitude of eastern border 103° 30′.

CONNECTICUT.

BRIDGEPORT. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 0′; longitude of eastern border 73° 0′.

DERBY. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 15′; longitude of eastern border 73° 0′.

MERIDEN. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 30′; longitude of eastern border 72° 45′.

NEW HAVEN. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 15′; longitude of eastern border 72° 45′.

NEW MILFORD. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 30′; longitude of eastern border 73° 15′.

NORWALK. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 0′; longitude of eastern border 73° 15′.

WATERBURY. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 30′; longitude of eastern border 73° 0′.

GEORGIA.

ATLANTA. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 33° 30′; longitude of eastern border 84° 0′.

CARNESVILLE. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 34° 0′; longitude of eastern border 83° 0′.

GAINESVILLE. Scale 1:125,000; contour interval 100 ft.

Latitude of southern border 34° 0′; longitude of eastern border 83° 30′.

IDAHO.

CAMAS PRAIRIE. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 43° 0′; longitude of eastern border 115° 0′.

MOUNTAIN HOME. Scale 1:125,000; contour interval 50 ft. Latitude of southern border 43° 0′; longitude of eastern border 115° 30′.

ILLINOIS.

DESPLAINES. Scale 1:62,500; contour interval 10 ft. Latitude of southern border 41° 65′; longitude of eastern border 87° 45′.

RIVERSIDE. Scale 1:62,500; contour interval 10 ft. Latitude of southern border 41° 30′; longitude of eastern border 87° 45′.

IOWA.

BALDWIN. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 42° 0′; longitude of eastern border 90° 45′.

CEDAR RAPIDS. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 45′; longitude of eastern border 91° 30′.

DAVENPORT. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 30′; longitude of eastern border 90° 30′.

DE WITT. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 45′; longitude of eastern border 90° 30′.

DURANT. Scale 1:62,500; contour interval 20 ft. Lati-

tude of southern border 41° 30′; longitude of eastern border 90° 45′.

MAQUOKETA. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 42° 0′; longitude of eastern border 90° 30′.

MONTICELLO. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 42° 0′; longitude of eastern border 91° 0′.

TIPTON. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 45′; longitude of eastern border 91° 0′.

WHEATLAND. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 45′; longitude of eastern border 90° 45′.

WILTON JUNCTION. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 30′; longitude of eastern border 91° 0′.

KANSAS.

ANTHONY. Scale 1:125,000; contour interval 20 ft. Latitude of southern border 37° 0′; longitude of eastern border 98° 0′.

CALDWELL. Scale 1:125,000; contour interval 20 ft. Latitude of southern border 37° 0′; longitude of eastern border 97° 30′.

CHENEY. Scale 1:125,000; contour interval 20 ft. Latitude of southern border 37° 30′; longitude of eastern border 97° 30′.

GREAT BEND. Scale 1:125,000; contour interval 20 ft. Latitude of southern border 38° 0′; longitude of eastern border 98° 30′.

HUTCHINSON. Scale 1:125,000; contour interval 20 ft.

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Latitude of southern border 38° 0′; longitude of eastern border 97° 30′.

KINGMAN. Scale 1:125,000; contour interval 20 ft. Latitude of southern border 37° 30′; longitude of eastern border 98° 0′.

KINSLEY. Scale 1:125,000; contour interval 20 ft. Latitude of southern border 37° 30′; longitude of eastern border 99° 0′.

LARNED. Scale 1:125,000; contour interval 20 ft. Latitude of southern border 38° 0′; longitude of eastern border 99° 0′.

LYONS. Scale 1:125,000; contour interval 20 ft. Latitude of southern border 38° 0′; longitude of eastern border 98° 0′.

NESS CITY. Scale 1:125,000; contour interval 20 ft. Latitude of southern border 38° 0′; longitude of eastern border 99° 30′.

PRATT. Scale 1:125,000; contour interval 20 ft. Latitude of southern border 37° 30′; longitude of eastern border 98° 30′.

SPEARVILLE. Scale 1:125,000; contour interval 20 ft. Latitude of southern border 37° 30′; longitude of eastern border 99° 30′.

KENTUCKY.

HAZARD. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 37° 0′; longitude of eastern border 83° 0′.

MANCHESTER. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 37° 30′; longitude of eastern border 83° 30′.

SALYERSVILLE. Scale 1:125,000; contour interval 100 ft.

Latitude of southern border 37° 30′; longitude of eastern border 83° 0′.

MAINE.

BIDDEFORD. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 43° 15′; longitude of eastern border 70° 15′.

KENNEBEC. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 43° 15′; longitude of eastern border 70° 30′.

NEWFIELD. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 43° 30′; longitude of eastern border 70° 45′.

PORTLAND. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 43° 30′; longitude of eastern border 70° 15′.

MAINE AND NEW HAMPSHIRE.

DOVER. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 43° 0′; longitude of eastern border 70° 45′.

YORK. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 43° 0′; longitude of eastern border 70° 30′.

MONTANA.

LIVINGSTON. Scale 1:250,000; contour interval 200 ft. Latitude of southern border 45° 0′; longitude of eastern border 110° 0′.

NEVADA.

CARSON. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 39° 0′; longitude of eastern border 119° 30′.

NEW HAMPSHIRE AND VERMONT.

BRATTLEBORO. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 42° 45′; longitude of eastern border 72° 30′.

NEW JERSEY.

BRIDGETON. Scale 1:62,500; contour interval 10 ft. Latitude of southern border 39° 15′; longitude of eastern border 75° 0′.

GLASSBORO. Scale 1:62,500; contour interval 10 ft. Latitude of southern border 39° 30′; longitude of eastern border 75° 0′.

EGG HARBOR. Scale 1:62,500; contour interval 10 ft. Latitude of southern border 39° 15′; longitude of eastern border 74° 30′.

HAMMONTON. Scale 1:62,500; contour interval 10 ft. Latitude of southern border 39° 30′; longitude of eastern border 74° 45′.

HIGH BRIDGE. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 40° 30′; longitude of eastern border 74° 45′.

MAURICE COVE. Scale 1:62,500; contour interval 10 ft. Latitude of southern border 39° 0′; longitude of eastern border 75° 0′.

MULLICAS. Scale 1:62,500; contour interval 10 ft. Latitude of southern border 39° 30′; longitude of eastern border 74° 30′.

SALEM. Scale 1:62,500; contour interval 10 ft. Latitude of southern border 39° 30′; longitude of eastern border 75° 15′.

SOMERVILLE. Scale 1:62,500; contour interval 20 ft.

Latitude of southern border 40° 30′; longitude of eastern border 74° 30′.

TUCKAHOE. Scale 1:62,500; contour interval 10 ft. Latitude of southern border 39° 15′; longitude of eastern border 74° 45′.

NEW JERSEY AND DELAWARE.

BAYSIDE. Scale 1:62,500; contour interval 10 ft. Latitude of southern border 39° 15′; longitude of eastern border 75° 15′.

NEW JERSEY AND PENNSYLVANIA.

BURLINGTON. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 40° 0′; longitude of eastern border 74° 45′.

DELAWARE WATER GAP. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 40° 45′; longitude of eastern border 75° 0′.

EASTON. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 40° 30′; longitude of eastern border 75° 0′.

LAMBERTVILLE. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 40° 15′; longitude of eastern border 74° 45′.

PHILADELPHIA. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 39° 45′; longitude of eastern border 75° 0′.

WALLPACK. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 0′; longitude of eastern border 74° 45′.

NEW YORK.

BROOKLYN. Scale 1:62,500; contour interval 20 ft.

Latitude of southern border 40° 0′; longitude of eastern border 73° 45′.

NEW YORK AND CONNECTICUT.

STAMFORD. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 0′; longitude of eastern border 73° 30′.

NEW YORK AND NEW JERSEY.

GREENWOOD LAKE. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 0′; longitude of eastern border 74° 15′.

HARLEM. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 40° 45′; longitude of eastern border 73° 45′.

RAMAPO. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 0′; longitude of eastern border 74° 0′.

STATEN ISLAND. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 40° 30′; longitude of eastern border 74° 0′.

NORTH CAROLINA.

WILKESBORO. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 36° 0′; longitude of eastern border 81° 0′.

PENNSYLVANIA.

CATAWISSA. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 40° 45′; longitude of eastern border 76° 15′.

LEBANON. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 40° 15′; longitude of eastern border 76° 15′.

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SCRANTON. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 41° 15′; longitude of eastern border 75° 30′.

TEXAS.

ALBANY. Scale 1:125,000; contour interval 50 ft. Latitude of southern border 32° 30′; longitude of eastern border 99° 0′.

ANSON. Scale 1:125,000: contour interval 50 ft. Latitude of southern border 32° 30′; longitude of eastern border 99° 30′.

CLEBURNE. Scale 1:125,000; contour interval 50 ft. Latitude of southern border 32° 0′; longitude of eastern border 97° 0′.

DALLAS. Scale 1:125,000; contour interval 20 ft. Latitude of southern border 32° 20′; longitude of eastern border 96° 20′.

FORT WORTH. Scale 1:125,000; contour interval 20 ft. Latitude of southern border 32° 30′; longitude of eastern border 97° 0′.

PALO PINTO. Scale 1:125,000; contour interval 50 ft. Latitude of southern border 32° 30′; longitude of eastern border 98° 0′.

WEATHERFORD. Scale 1:125,000; contour interval 50 ft. Latitude of southern border 32° 30′; longitude of eastern border 97° 30′.

VERMONT.

WILMINGTON. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 42° 45′; longitude of eastern border 72° 45′.

VIRGINIA.

FARMVILLE. Scale 1:125,000; contour interval 50 ft.

Latitude of southern border 37° 0′; longitude of eastern border 78° 0′.

PALMYRA. Scale 1:125,000; contour interval 50 ft. Latitude of southern border 37° 30′; longitude of eastern border 78° 0′.

ROANOKE. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 37° 0′; longitude of eastern border 79° 30′.

VIRGINIA AND WEST VIRGINIA.

DUBLIN. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 37° 0′; longitude of eastern border 80° 30′.

WEST VIRGINIA.

HUNTERSVILLE. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 38° 0′; longitude of eastern border 80° 0′.

KANAWHA FALLS. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 38° 0′; longitude of eastern border 81° 0′.

NICHOLAS. Scale 1:125,000; contour interval 100 ft. Latitude of southern border 38° 0′; longitude of eastern border 80° 30′.

WISCONSIN.

MADISON. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 43° 0′; longitude of eastern border 89° 15′.

STOUGHTON. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 42° 45′; longitude of eastern border 89° 0′.

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SUN PRAIRIE. Scale 1:62,500; contour interval 20 ft. Latitude of southern border 43° 0′; longitude of eastern border 89° 0′.

UNITED STATES. Map of the United States, compiled under the direction of Henry Gannett, chief topographer, and Harry King, chief draughtsman. Scale 1:2,500,000, approximated, 40 miles to the inch. 1890.

——*Same.* Without contour lines.

PEARY'S GREENLAND EXPEDITION.—According to a despatch to the New York *Herald*, Mr. Peary's vessel, the *Kite*, arrived on the 15th of June at the Strait of Belle Isle, which was found to be packed with ice. The strait was cleared on the 20th, and on the 23d the coast of Greenland was sighted. The *Kite* reached Godhavn June 29th, and left it the same day for Upernivik and Whale Sound.

A later report to the *Herald* of August 24th is pervaded by a tone of discouragement, justified by nothing in the facts. Only the human alacrity in sinking can excuse the suggestion of a relief party next year. The conditions of the enterprise are precisely what they were, with the single exception of the accident which has disabled Mr. Peary for a short time; and accidents are not peculiar to Greenland.

A long article, published in the *Herald* of September 3d, reiterates with exaggeration the forebodings of the telegraphic despatch. Both documents, when read at a future time, may interest, if they do not please, the prophets of evil; and meanwhile Dr. Keeley, when he

returns, should have something to say about his reported attempt to purchase an Eskimo child. The despatch follows:

ST. JOHNS, N. F., August 23, 1891.—The Arctic steamer *Kite* arrived here to-day with reports of interesting experiences in Greenland, which include a struggle of three weeks with bergs and floe ice in Melville Bay, during which period she made only 100 miles. Lieutenant Peary, his wife and five associates were landed in McCormick Bay, Murchison Sound. Whale Sound, his original destination, was frozen over and inaccessible by reason of ice islands and bergs.

While in Melville Bay Peary broke his leg below the knee and he was landed from the *Kite* on a stretcher. The accident occurred on July 11, about latitude 75 degrees, longitude 58 deg. 57 min.

The steamer had been jammed in about the same position for some time. In the evening of that day a strong breeze came up and the ice opened a little and the vessel commenced cutting her way through. The *Kite* came to a heavy bar of ice and the order was given to go astern and then charge the obstruction. Lieutenant Peary was behind the wheelhouse, unknown to the officer on the bridge. The rudder struck a large cake of ice and was knocked over to port. The wheel was sent flying out of the hands of the two helmsmen, the iron tiller hitting Lieutenant Peary on the right leg below the knee, breaking both bones.

It was a clean break, and everything looked favorable for a rapid recovery. He was carried below and a couch rigged up for him in the saloon. His private physician, Dr. Cook, decided that the occurrence need not interfere with the expedition, as he would probably be as well as ever in three months from the time of the accident.

ATTACKED BY A BEAR.

On July 16 the *Kite* was nearly lost. She got nipped between two floes, which began to come together rapidly. All hands were put to work, and by digging and blasting the vessel was saved from destruction. On the same night a polar bear attacked the ship and was killed at a range of fifty-nine yards, several shots out of the volley of thirty bullets having taken effect.

By a series of small stages Cape York was reached July 20. It seemed impossible to go further and it looked as if the expedition must be abandoned, as it appeared impracticable to land even there. On July 23, however, the ice suddenly opened and a course was made clear to McCormick Bay. The spot selected for the camp was on the south side of the bay, latitude 77 deg. 43 min., longitude 70 deg. 18 min., or about on a line with the most northerly point reached by the *Jeannette* expedition.

CAMPED AMID GLACIERS.

A house was built on the slope of a mountain eighteen hundred feet high, with the glaciers pouring down the hills in all directions. On July 30 the *Kite* bade the party farewell and steamed south. Lieutenant Peary wished to impress upon his friends in the United States that the accident to his leg was of small account. This fall the members of his party will explore the Humboldt Glacier—Mrs. Peary, perhaps, going along—and next April or May he and two others will go north to find the northern terminus of Greenland. Lieutenant Peary relies on his whaleboats to get back to Danish Greenland, a distance of six hundred miles, after the work is done next year. It is the unanimous opinion of the *Kite's* captain and officers and the Academy party that he cannot do this with his force, and that to attempt it would be folly. If, therefore, a relief expedition is not sent next year the outfit will be in a bad way.

An interesting study was made by the Academy party of Arctic highlanders of Ittiblu and Cape York. A native tent, two kayaks, or canoes, and weapons were secured for the World's Fair. This is undoubtedly the most complete collection ever made.

A GREAT TROPHY.

The real trophy of the entire expedition was secured on Disco Island in the shape of a three hundred pound meteorite. Three small fragments of meteorites were found there by Nordenskjold, in 1875, and the Swedish government fitted out a ship to bring them back. An American institution offered $10,000 for one, but this was declined. The German Government was to send an expedition next year to look for more. The German scientist Drygalski arrived in Disco just before the *Kite* arrived, but postponed the meteorite hunt until then. Two days after he left Greenland a professor named Heilprin made a trip to Ovifak in a native boat, and took all there were. They will be sent to the Philadelphia Academy. The only museums now possessing specimens are Stockholm and Copenhagen. Under the Danish treaties with Great Britain and the United States the entire expedition is technically a piratical one. The treaties say that any ship landing on Greenland without permission of the Danish government shall be confiscated and all on board punished. If the law were carried out all the scientists would have been sent in chains to Denmark, as Lieutenant Peary had neglected to go through the formalities. On this account he was refused guides, dogs and other assistants, both at Godhavn and Upernavik.

NEARLY LOST IN A STORM.

Besides the dangers of ice the *Kite* was nearly lost off Cape Parry in a terrific gale, the worst ever experienced by Captain Pike. There

was also a dangerous combination of leeshore fog and icebergs. Ten days later the ship went ashore in Waigat Channel, between Disco Island and the mainland, but the tide was low and the water smooth, and she floated off.

Among the relics secured were a corpse of an Arctic Highlander, two years dead, and a fine assortment of Eskimo skulls. The entire party are in high spirits, though they had nothing but head winds since leaving New York. Valuable photographs were obtained, a team of young Eskimo dogs and sledges were secured. All explorations south of Godhavn on return journey were prevented by heavy weather and scarcity of coal. So much coal was used up in fighting the ice that Peary will possibly be left with only seven tons for winter. This will be barely sufficient for cooking and heating.

McCormick Bay is a gloomy spot at best, even with the sun high above the horizon twenty-four hours a day, as when the *Kite* was there. With the sun out of sight the high hills on all sides will make the prospect indeed dark and hideous. It seems fitted only for a winter home for bears and white whales, which abound.

Professor Heilprin found the altitude of the ice cap near the camp twenty-four hundred feet, and the party must take sledges and supplies up the glacier to this height before beginning the trip. If the party is detained on the ice cap a few weeks there will be a danger of starving, as no food can be secured after the start. The academy party certainly had their fill of Arctic experiences. Among the food they were forced to eat are bear's blood pudding, bear tongue, patty of bear heart, sandwiches of seal pie, sea gulls and many varieties of birds. Lieutenant Peary saved a bear carcass for winter use.

PREPARING TO RETREAT.

At one time during the Melville Bay experience it seemed certain that the ship would be detained in the ice all winter, as the water froze continually and cold weather seemed to have set in. There was no food on the vessel for any such period, and preparations were almost begun for a retreat over the ice when the floes broke up. The scientists lost greatly by the detention in Melville Bay. Captain Pike had warned Lieutenant Peary not to go into the bay so early, but the Lieutenant was bent on arriving at destination on the Fourth of July. Instead of that the day was celebrated with ice for a horizon all round. Berg climbing, seal hunting and snowballing were the sports. The scientists could have spent the time better in South Greenland, however, botanizing, and they chafed under the delay.

The Danish officials in Greenland consider the presence of Mrs. Peary

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on the expedition most unwise. It is possible that but for the accident to her husband she would have returned on the *Kite*.

In the latitude of Camp Peary the Arctic night begins at the end of October and lasts 113 days. The members of the party who are in the best condition after that will go North. Lieutenant Peary, if not relieved, will start home at the beginning of August, as he is not provisioned for a second winter.

There are many reindeer near the camp but the prospects for game are not very bright. Caches of blubber were found near the camp, showing the presence of natives in the neighborhood.

The Hydrographic Office chart of the coast north of Cape York was found very defective as to distances and bearings, and it was not possible to verify latitudes and longitudes, as the sun allowed of no observations during the sojourn of the *Kite*. In fact, no sights were possible during the last seven weeks of the trip.

RELIEF EXPEDITION PROBABLE.

The *Kite* left Godhavn homeward bound last Wednesday week. The Academy party will probably sail from here in the Allan line steamer for Baltimore next Wednesday. If these arrangements cannot be completed they will probably charter the *Kite* to take them to New York. The large quantity of material secured makes it advisable to get the *Kite* if terms can be made. There is a very strong probability that the Academy party will get up a relief expedition next year, as the opinion is general among them that some disaster is likely to happen if this is not done. Lieutenant Peary had no conception of the difficulty of crossing Melville Bay in whaleboats. Captain Pike says his boats are not suited for the journey as they are not strong enough to haul over the ice.

Dr. Keeley, the ship's surgeon, tried to buy an Eskimo child at Cape York, but though the natives were destitute and sadly in need of wood and weapons, they could not be prevailed on to sell one of their children. This settlement is said to be dying out. Only forty-eight Eskimos from three villages boarded the ship. Settlements not previously discovered were found on Saunders and Herbert islands, but the natives were away. Lieutenant Peary arranged with Professor Putnam, of the ethnological department of the World's Fair, to send home an Eskimo winter hut, but as it was made of stone and weighed twenty tons it was found impossible to put it on board the ship. A skin house was bought instead from the Ittiblu village.

September 15.

The foregoing was already in type, when a letter, dated July 27, was received from Mr. Peary, with the

following report, to which is added a letter, published in the *Sun*, of September 6:

NORTH GREENLAND EXPEDITION OF 1891-92.

R. E. PEARY, U. S. NAVY.

McCORMICK BAY, GREENLAND, JULY 27, 1891.
Lat. 77° 40′ N. Long. 70° 40′ W.

A brief note of the voyage of the *Kite* with the North and West Greenland Expeditions on board may be of interest, but circumstances compel brevity.

The voyage has been exceptional in several respects.

In the first place heavy ice interspersed with small bergs was found filling the Straits of Belle Isle from end to end and extending in a solid pack sixteen miles to the east of Belle Isle. The strong current packed this so closely that the *Kite* was eighty-six hours forcing her way through.

From Belle Isle to Cape Desolation strong northwesterly winds were encountered rising finally to a gale with very rough sea.

Since sighting the Greenland coast, however, there has been no wind stronger than a light breeze from any direction, and with the exception of the time that the *Kite* was ice-bound in Melville Bay the weather has been uniformly clear, calm and warm, and the entire Greenland coast from Cape Desolation to Cape Walker, and from Cape York to Cape Saumarez, has been spread sharp and distinct before our eyes.

Not a cake or piece of ice was seen until the edge of the Melville Bay pack off the Devil's Thumb was reached.

The ice in Melville Bay, though it delayed us three weeks, was very rotten and rapidly melting away, but was yet too heavy for the *Kite* to steam through, and the entire absence of wind kept it stationary and opened no leads for us to take advantage of.

The ice had every appearance of not having been disturbed by any heavy weather during the entire season.

Once out of the pack and into the North Water off Conical Rock, a long swell from the north showed the existence of open water extending undoubtedly to Littleton Island or beyond.

The mouth of Whale Sound as far as the east end of Herbert Island is entirely open, but further up the ice is still undisturbed.

The weather has been delightful ever since we entered the Sound, and indications of the presence of natives in the shape of baited fox traps and caches of blubber have been found whenever a landing has been made.

The east side of McCormick Bay has been selected as the site of my house, the previously proposed site farther up the Sound being inaccessible on account of the ice. R. E. PEARY, U. S. N.

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NORTH GREENLAND EXPEDITION OF 1891–92.
McCORMICK BAY, GREENLAND, JULY 26.
Lat. 77° 40′ N. Long. 70° 40′ W.

At last the *Kite* has reached her haven, and after forty-eight days of battling with Arctic seas and ice packs, lies moored within the midnight shadow of the snow-capped cliffs that line the northern shore of Whale Sound. Our latitude is 26′ great than that of the *Jeannette* when crushed. For eight years no ship has wakened the echoes of these cliffs with her whistle; in fact, no ship ever penetrated as far into the Sound as this. Baffin anchored somewhere within the sound on July 4, 1616, and Hayes, while on his homeward voyage in 1861, leaving his schooner outside, came in in a boat and took a round of angles and named prominent points and indentations.

It is with feelings of eagerness and impatience that the eyes of the North Greenland expedition scan the wild shore and the surroundings of what is to be our home for the next year.

The northward voyage of the *Kite* has been exceptional in several respects, some favorable, some the reverse. Leaving New York on the 6th of June, the voyage to Sydney was made in five days. Stopping here one day to coal we got under way again on the 12th (Friday), for the Straits of Belle Isle. On Monday morning in thick fog we ran into heavy pack ice extending entirely across the southwest entrance to the Straits, and did not get through the Straits and into open water east of Belle Isle until 4.30 o'clock Friday afternoon.

The occurrence of heavy Arctic ice in the Straits of Belle Isle, choking it from end to end and extending unbroken a distance of sixteen miles to the eastward of Belle Isle, was unprecedented for this time of the year.

Once clear of the Straits we encountered the kind of weather to be expected at this time in the North Atlantic, *i. e.*, what the sailors call "dirty," until Cape Desolation off the Greenland coast was sighted at midnight of the 23d.

Then there was a complete change, and from here to Godhavn, which was reached early in the forenoon of the 27th, we enjoyed such an uninterrupted view of the wild, majestic scenery of the Greenland coast, such a continuation of calm seas and clear sunshine, and such an utter absence of ice as has probably been experienced by no other Arctic expedition. No pack ice whatever was seen, only the fleets of stately icebergs which always guard these Greenland coasts.

At Godhavn just such a perfect day smiled on us as greeted me five years ago; the great red brown cliffs across the harbor seemed like old friends, icebergs glistened in the brilliant sunlight, and snowbuntings hopped and twittered over the rocks.

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The place itself, it is hardly necessary to say, had not changed. No building boom has reached here yet, and the real estate market is as flat as ever. Inspector Andersen's family is a little larger than it was five years ago and Gov. Jansen's ditto, but the inspector and Mrs. Andersen are the same genial, hospitable, homelike couple as ever.

Frederick, my former guide and interpreter, was as ugly as to his face and broken as to his English as ever, and Broberg, the pilot, had not changed a hair; Ikkias and fat Jacob of my old crew were still as ever, but the belles of the town were married, and Hans Hendrick, the Eskimo, who had accompanied so many expeditions, has been dead for three years.

After the formality of a call on Inspector Andersen, accompanied by Prof. Heilprin, Dr. Sharp, and Mrs. Peary, the freedom of the place was given to the expeditions and the members immediately started out for a field day.

All the members of the north Greenland party, accompanied by Profs. Heilprin and half of the west Greenland section, started for the ice cap peering down from the summit of the island through the gorge opposite the settlement. First over the rocks surrounding the harbor, then through the moss-covered, flower-strewn valley, up steep mossy slopes, over the crumbling talus of débris from the cliffs, through a steep defile, then up a slope barren as an ash heap, except for the presence of yellow poppies. It took us four hours of an Arctic afternoon to reach the edge of the ice cap, 2,400 above the sea.

Glowing with our experience, we felt no need of the extra wraps we had brought along, but used them for cushions, and seating ourselves enjoyed the scene around and below us—scenery that can be duplicated nowhere but in Greenland.

Almost at our feet, framed by the walls of the gorge through which we had ascended, lay the town and harbor of Godhavn (the houses mere specks), and the *Kite* and Danish brig in the harbor—toy boats.

Beyond the town the soft blue of Disco Bay rose, dotted with icebergs, far distant misty Egedesminde and the Crown Prince Islands. To our right over the ice cap the blue of Baffin's Bay climbed upward till lost in the golden splendor beneath the western sun. Over the ice cap to our left, Disco Bay, expanding to the Jacobshavn Mountains, bore upon its placid bosom hundreds of icebergs, the output of the mighty Jacobshavn Glacier, whose gleaming front was visible breaking the dark round of the mountains. Behind us was the eternal, unbroken, serene ice cap, smooth as marble, undulating gently.

After the party had feasted upon the scene, all turned to build a cairn in memory of the visit of the Greenland expeditions. When completed

to a height of about eight feet on an outcrop of the ledge, the date, the names of the party, and a few American coins were put in a little tin box and deposited in the cairn. Then the party returned to the *Kite*, tired and hungry, but enthusiastic over their Greenland field day.

The next day, though Sunday, was devoted to excursions to points of interest in the neighborhood of Godhavn. In the evening, accompanied by Professor Heilprin, Mr. Astrup, Mr. Kenealy and Mrs. Peary, I dined with Inspector Andersen and Governor Carstens and their families at the Inspector's. After the dinner we looked on for a little time at a native dance in one of the Government buildings, and then returned to the Inspector's house to pass a pleasant evening, with coffee, hot toddy, and the examination of Inspector Andersen's valuable collection of minerals and eggs.

As we made our adieus and took the narrow but well-beaten path down to the little landing where the boat lay waiting to carry us out to the *Kite*, the great brown cliffs rose high into the yellow radiance of the northern sky, casting the little settlement in shadow, but beyond the harbor the icebergs glowed in the yellow sunlight.

On Monday morning I had intended to get under way early, but a southwester, accompanied by a very dense fog, held us in the harbor until 2 P. M., when we steamed out with flags dipping and a salute from the ship's cannon and all the small arms on board.

Once out of the harbor and through a large fleet of bergs cruising off the entrance we shaped our course north and went along the shore of Disco Island, and thirty-six hours later cast anchor in the harbor of Upernavik. During all these hours we steamed through a sea on which hardly a ripple could be seen, dotted here and there with bergs, but absolutely clear of ice, past a continually sunlit coast the Waigat, Noursoak Peninsula, broad-mouthed Omenak Fiord, with the great inland ice visible far up at its head. Black Hook of the Old Dutch navigators, and sublime Sanderson's Hope all stood out in their grandest, most brilliant aspect.

Governor Beyer, of Upernavik, was found to be a very different man from genial Inspector Andersen, and finding it impossible to obtain either a kayak or a native interpreter to go along with us, I returned his official call, accompanied by Professor Heilprin and Mrs. Peary, and then got under way as soon as the fog lifted.

Still our charming weather kept with us, and all night long, after leaving the most northerly town on the globe, with bow turned northward, the *Kite* steamed over summer seas, past the numerous red-brown islands that guard this Arctic coast. Through every depression in the mountains, and from every fiord head, the marble surface of the inland

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ice looked down upon us, the crevasses in its lower portions, visible at times with the naked eye, past many giant milestones by which the whalers measure their advance in their yearly battles with the ice-floes, we steamed without seeing a bit of ice, and at 6 in the morning reached the Duck Islands, a well-known rendezvous and lookout for the whalers while waiting for the ice barriers of Melville Bay to open for them.

At these islands we stopped till afternoon, laying in a supply of eider ducks, which breed here in thousands. Unfortunately we were too late to get eggs, all being too far advanced to be edible.

Leaving the islands our course was shaped direct for Cape York, with the most sanguine expectations of making a speedy passage across Melville Bay, and perhaps reaching Whale Sound on the 4th of July, the day on which old Baffin cast anchor in the Sound 275 years ago. Our expectations, however, were destined to a speedy downfall. Sixteen miles north of the Dutch Islands we encountered the dreaded Melville Bay pack, and, after running along its edge close into the Devil's Thumb and then back again to the westward in search of a good opening the *Kite*, at 7.30 P. M., on July 2, stuck her sturdy little nose into the pack and began her long battle. Three weeks later, on the morning of the 23d, she emerged from the ice off Conical Rock. Annoying and dull as these three weeks would be under any circumstances, two of them have been especially so to me, laid up on my back with a broken leg.

The accident was caused by a large cake of ice coming in contact with the *Kite's* rudder, while she was going astern, the shock tearing the wheel from the hands of the men stationed at it, and driving the iron tiller against my leg with sufficient force to snap the bone above the ankle.

Though a simple fracture that has already begun to knit, and scarcely more serious than the loss of a finger, the accident has been a severe strain upon my patience.

It will naturally affect the amount of work that I can do this season, as it will confine me for some weeks longer, but it will not interfere with the long sledge journey of next spring.

Once free of the ice and into the north water the *Kite* came merrily along past Wolstenholme Island and Sound, and rounded Cape Parry into Whale Sound.

At Barden Bay we stopped at an Eskimo settlement with a population of seven adults and five children, and obtained some silver, ivory, etc. Then we steamed to Herbert Island, but found no natives, and then shaped a course up the Sound for the proposed site of the house near Cape Tyrconnel.

Our progress was soon stopped, however, by the ice extending un-

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broken from the east end of Herbert Island to Cape Powlet. Coming about, the *Kite* steamed up between Northumberland Island and Herbert Island, and attempted to get to the eastward through Murchison Sound, north of Herbert Island. Again the ice extending from the east end of Herbert Island to the north end of the Sound barred our advance, and finding it impossible to get further up the Sound, the winter ice not yet having come out, the *Kite* was run into McCormick Bay, and after a reconnoissance of both shores my house will be built on the east side, with an outlook to the southwest, and front Northumberland and Hakluyt Islands.

The site of the house is bright with flowers, and there are numerous traces of reindeer, foxes and hares. Seals and walrus are abundant in the water. Traces of natives are more numerous than I had anticipated. Although we have found but one inhabited village, others visited are evidently only temporarily deserted, and wherever a landing has been made baited fox traps and caches of meat and blubber have been found. All indications are that the expedition will not suffer for provisions.

R. E. PEARY.

THE FLEMISH FOUNDERS OF NEW YORK.—Mr. Virlet d'Aoust's letter on the foundation of New York in 1623 by a colony of Walloons and Flemings is printed in the *Compte Rendu* of the Paris Société de Géographie, No. 12, 1891.

It tells the well-known story of Jesse de Forest, who sailed from the Texel in the ship *New Netherland*, in March, 1623, with a company of emigrants, to whom the States-General had given permission to settle in the Dutch possession of New Netherland in America.

This settlement, which occurred in May, 1623, Mr. Virlet d'Aoust chooses to consider as the foundation of the city, *wrongly called* at first New Amsterdam, instead of New Avesnes, and since known by the "glorious name" of New York. He has reconstituted the history of Jesse de Forest from the study of printed documents, with which other scholars have been acquainted for

years, and also from information furnished by members of the de Forest family; and he closes his note with the following flight of imagination:

"Rome, Ancient Rome, raised her founders, Remus and Romulus, to the rank of the gods. The modern American Rome will undoubtedly scorn to remain below the level of her predecessor, and the municipal administration of New York will some day think of raising a monument to the memory of the Avesnois Fleming, Jesse de Forest, the city's first founder, who sacrificed to her his great fortune and his life."

To men less deeply stirred in mind than Mr. Virlet d'Aoust New York resembles Rome as Monmouth does Macedon, and there are difficulties in the way of the proposed monument. It would overtax the resources of art to represent Jesse de Forest as the twins, Romulus and Remus. Romulus, in any case, he could not be, for he fell a sacrifice to the great city; and, for the other, no eloquence could move the Board of Aldermen to vote an appropriation for a statue of Uncle Remus.

LABRADOR. — The Bowdoin College expedition, which entered Labrador in the month of July, returned to the coast, on the 1st of September, having accomplished the principal object, the discovery of the Falls of the Grand or Hamilton river. Mr. Randle F. Holme, who journeyed in Labrador from July to October, 1887, but failed to reach the Falls, describes them from report and knowledge of the country as probably the most stupendous falls in the world, though it is rash to use superlatives in such cases. Mr. Holme's reasoning is

good. He says (*Proceedings*, Royal Geographical Society, 1888, pp. 197–198):

"The centre of Labrador, as is generally known, is a vast tableland, the limits of which are clearly defined, though of course the country intervening between this limit and the coast always consists, more or less, of a slope. Roughly speaking, it may be said that in the south and north there is a more or less gradual slope from the height of land to the coast, while in the south-east the descent is sudden, and almost immediately after leaving the tableland there is reached a level which is but little above that of the sea. . . . On the height of land there is found a succession of great lakes joined together by broad placid streams. When the streams of water reach the edge of the tableland, they of course commence a wild career down towards the sea. In the case of the Grand River this rapid descent begins with the Grand Falls, and almost the whole of the great drop to the sea-level is effected in the one waterfall. The elevation of the Labrador tableland is given by Prof. Hind as 2,240 feet. . . . But in the Grand River below Lake Waminikapou there is only one fall, viz., that which occurs 25 miles from the river-mouth. This fall is 70 feet. . . . Now the lake first above the Grand Falls is on the height of land. . . . It follows, assuming the elevation of the tableland on the east to be approximate to that on the south, that in the 30 miles beginning with the Grand Falls and ending with Lake Waminikapou, there is a drop of about 2,000 feet."

According to a telegram dated September 11, from Port Hawkesbury, Cape Breton, the discovery was made by two of the Bowdoin College party, Messrs.

Cary and Cole, who reached the Falls on the 13th of August. They were provided with instruments for measuring heights and distances, and it is implied in the following extract that these were put to good use:

"As they neared the falls a truly magnificent sight was spread out before them. The spray, which was visible 20 miles, rose in a cloud, and the solid rock beneath their feet trembled perceptibly.

"From the falls the water flows through a cañon formed of archæan rock, the sides of which rise to a height of 500 feet. Through this cañon water flows with terrific force, making it absolutely impossible for any boat to live.

"The height of the falls has been grossly exaggerated, and, while presenting a grand and beautiful sight, measures only 200 feet in a perpendicular fall, the rapids leading to this fall increasing the total altitude of the falls to 500 feet.

"Above the falls the average width of the river is 500 yards, narrowing until it reaches the falls to a width of only fifty yards, when it plunges with a terrific roar over the edge and falls into the narrow gorge below. Mr. Cole descended to the foot of the falls and succeeded in obtaining some good photographs of them.

"Having completed the observations of the falls, the party went on a few miles above to the Height of Land, where, from a peak christened by them "Mount Hyde-Bowdoin," they had a fine prospect of the surrounding country. The plateau is nearly all wooded, with a thick, though not, large, growth of soft timber."

It is not to be doubted that two officers of the Hudson Bay Company had visited the Falls; one Mr. Ma-

clean, who was stopped by them in 1839, and the other, Mr. Kennedy, who some thirty years ago was in charge of Fort Nascopee on Lake Petchikapou. Mr. Holme says (*Proceedings*, R. G. S., 1888, p. 197) that he got considerable information from Mr. Kennedy's guide to the Falls, an Indian named Louis, now a cripple.

Messrs. Cary and Cole are none the less entitled to the honor of the discovery.

ROBERVAL'S FORT.—A note in Sweetser's *Hand-Book of the Maritime Provinces, Boston and New York, 1890, p. 301*, suggests the possibility of light on a mystery of early Canadian exploration. This note says:

"Mr. Price, M. P., states that a missionary has recently discovered, high upon the Saguenay (or on the Mistassini) an ancient French fort, with intrenchments and stockades. On the inside were two cannons, and several broken tombstones dating from the early part of the 16th century. It is surmised that these remote memorials mark the last resting-place of the Sieur Roberval, Governor-General of Canada, who (it is supposed) sailed up the Saguenay in 1543, and was never heard from afterwards."

Like all the professed discoveries of Roberval's Fort, this also resolves itself into surmise and supposition. Mr. E. E. Taché, Assistant-Commissioner of Crown Lands for the Province of Quebec, says in a recent letter to Mr. F. A. Stout, of this Society:

"At last I am in a position to give you some kind of an answer to your various enquiries relating to the old forts on the Mistassini. As promised, the matter was referred to the Honorable Mr. Price, who directed one

of his superintendents to look into it. Herewith enclosed, I transmit you copy of Mr. Stinton's letter bearing on the subject and which, to some extent, corroborates my statements."

The enclosed letter reads:

"CHICOUTIMI, APRIL 13, 1891.

"*Dear Mr. Colston:*

"I think the supposed Fort on the River Mistassini is a myth, as I have seen all who ought to know and have had H. B. Co. records for years back overhauled.

"All places of trade in this section of the Fur Country were and are called forts, so every H. B. C. post is called a fort, even if only a log house, all Price's first establishments, especially at Chicoutimi and Sault au Cochon, in old times were called forts; the same for missionary establishments, and the Jesuits had, before our occupation, such a fort on the mouth of the Mistassini. About a century ago they abandoned it and went to Pointe Bleue; fifty years later they abandoned Pointe Bleue and went to Metabetchouan, and then abandoned that place, and are now replaced by the Pères Oblats.

"Malcolm Dechene, one of McLeod's voyageurs, now 94, says, when he was young the ruins of this Jesuit fort at Mistassini existed. He has seen them and thinks there was a graveyard, but certainly no inscriptions, and as regards cannon, 'none.' He says, however, very large swivel arquebusses have been found there, clumsy, bell-mouthed pieces, fired with a match instead of a lock; and I have myself seen one of these pieces, found near my house at Chicoutimi. It was about two inches bore and about double that at the mouth. . . .

"Believe me, yours very faithfully, A. STINTON."

THE GEOGRAPHICAL SOCIETY OF THE PACIFIC.—This Society, which was organized at San Francisco in March, 1881, has just issued the first number of Vol. II, of its *Transactions and Proceedings.* Its activity is, however, far greater than the statement of this fact implies.

The Secretary gives a list of 127 papers read at the meetings, up to June, 1891; a record that might be left to stand by its own merit, without the questionable addition that, "During the last ten years more papers have been read before the Geographical Society of the Pacific than before any other Geographical Society in the World, excepting the Royal Geographical Society of Great Britain and Ireland."

It ought to be known that the Royal Geographical Society is not of "Great Britain and Ireland," but of "London"; and it is enough to turn over the *Verhandlungen* of the Berlin Gesellschaft für Erdkunde to dispose of the claim made for the San Francisco Society.

The present number of the *Transactions and Proceedings* contains three papers: Humboldt Bay, by Prof. George Davidson; Geographical and Ethnographical Notes on Alaska, by Ivan Petroff; and Corea, the Hermit Kingdom, by John T. Scott.

Prof. Davidson, who knows the Pacific Coast as a pilot knows his harbor, finds that "Cabrillo and Ferrelo failed to see the land as far north as Cape Mendocino; that Drake merely indicated a receding shore north of Mendocino; that Vizcaíno, or his second in command, placed a 'Great Bay' just north of Cape Mendocino, without the peculiar land-locked characteristics of the present Bay; that Bodega, who surveyed Trinidad Bay in 1775, and who there discovered the peculiar type of our

tides, and who had much intercourse with the natives, failed to see or learn of its existence; that Vancouver twice passed it by without a sign of recognition; and that it was left to the American, Captain Jonathan Winship, in an American vessel, with an American crew; to discover the Bay in 1806, when temporarily in the service of the Russian American Company."

From this time Humboldt Bay remained practically unknown until 1849, when a party under Dr. Josiah Gregg came to it by land. The next year the channel was discovered by Capt. H. Bulme, then second officer of the U. S. Rev.-Mar. schooner *Laura Virginia*. The Bay then received its name. Five maps illustrate the paper.

Mr. Petroff gives the result of his observations among the Eskimo and Athabaskan families of Alaska, the former inhabiting the shores from the Copper River westward and northward and from Bering Strait easterly on the Arctic coast, and the latter being sparsely distributed throughout the interior, with one opening to the sea in Cook Inlet.

These two families are in contact along the banks of the Nushagak, the Kuskokwim and the Yukon rivers. On the Nushagak the Eskimo have given up the characteristic *Kayak*. Their houses are the most miserable Mr. Petroff has seen in Alaska. They are built underground, are lined with logs and covered with sods laid on a framework of poplar poles.

The Athabaskans, living on the Malchatna River which enters the Nushagak from the east, about 200 miles from tide water, live in log houses during the winter, but lead a roaming life during the summer. Fifty

or sixty miles from the mouth of the Malchatna is a portage route between the Nushagak and the Kuskokwim, not more than 30 miles across but through a swampy country, the water-shed which divides the rivers being only a thousand feet above the sea. Beyond the portage was the first Athabaskan settlement, but the sickness of his men forced Mr. Petroff to leave this unvisited and to return to the Nushagak. There he took the steamer along the coast to the Hagemeister Islands. The Eskimo came off in *kayaks* to beg for tobacco. They were almost without fire-arms, their weapons being spears and arrows.

The Kuskokwim was entered from the sea. The Eskimo frequent the lower river to hunt the grampus, which is left there stranded by the retreating tide. Rows of *beluga*, or white whale, skulls, which looked almost human, were arranged from the line of high-water up to the central ridge of the shore. The natives, when asked to explain this arrangement, answered that the hunters deposited the skulls of the animals killed in a continuous row; which seems to mean that the skulls were so arranged because they were put in that way, though it leaves us in the dark as to what becomes of the skulls of the animals that are not killed.

At this point of the river the opposite shore is never in sight, but at the lowest stage of the ebb tide the waters recede so that they cannot be seen from the shore.

The Kuskokwim Eskimo live in underground houses, with their dogs. They drink, when they are thirsty, any kind of water, even the "briny fluid," when they are at sea.

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Shevenagamute, the first trading post on the river, showed evidences of civilization, in the display of cotton goods and matches and the use of cooked food. The rate of exchange at this place was one needle for two salmon, two needles for a goose or a brace of ducks, and a fine-toothed comb for a dozen fish, or three or four ducks.

Twenty miles above this place the two banks of the river were visible at the same time, and villages were met with every ten or fifteen miles, each settlement containing one or two hundred persons.

At 100 miles from the sea the birch-bark canoe appeared, the river banks were higher, and the trees furnished building material for houses. At the Moravian Mission of Bethel there is a school, and some of the natives have learned to count in English up to thirty. Fire-arms are to be found in every habitation, and the reindeer have almost disappeared.

The limit of the Eskimo on this river is Kaltkhagmute. Here is an ancient burial place with carved monuments, mostly in human shape, with disk-like heads and grotesque features. Some of these figures are partially clad, and many have four and even six arms branching off ; a few of these holding wooden platters, on which offerings of tobacco and mink-skins are placed.

From this point the Yukon was reached by a four days' portage and two days on a tributary stream. Where this entered the Yukon is the Russian Mission of Ekogmute. The dwellings here are all above ground and are built of logs, and have roofs covered with earth. The mission is sixty years old, but does not seem to have modified the native ways of life.

On the river the people were engaged in catching the king salmon. The women and girls do the work of cleaning and drying the fish.

At Kozerevsky is a Jesuit Mission established two years ago, and three Sisters of St. Anne have made astonishing progress in teaching the children of the natives. There were twenty-four of these children, all speaking and reading English. They performed a play, written for them, and one presented a little paper to Mr. Petroff with these words written on it: "My name is Joseph and I am seven years old."

The boys are taught gardening, wood-carving, building, etc., and the girls make moccasins and shoes and other articles. One of the Sisters is a professional lace-maker from Belgium, and she has introduced the art.

These Ingaliks make pottery, not of a durable kind, but, as Mr. Petroff believes, the only native Alaskan pottery.

The attempt to introduce Siberian reindeer would fail, Mr. Petroff thinks, because the Alaskan Eskimo is a hunter, to whom an animal is only so much meat, and it would take generations to develop the habits of pastoral life. The Eskimo dogs, moreover, would exterminate the reindeer, if left to themselves.*

Mr. Scott makes no pretension to a close acquaintance with Corea. He visited the country in 1889, under

* Mr. Petroff was the special agent of the U. S. Census Bureau and his report, soon to be published, shows that the natives in Alaska are dying out. They number 8,000 less than they did ten years ago. There has been a large influx of whites and Chinese, but there is a decrease of 2,000 in the population of the Territory. The total population to-day is computed at 31,000, composed of 900 Aleuts, 5,000 Indians, 18,000 Esquimaux, 2,300 Chinese and 4,800 whites. In 1880 the number was 33.000, and since that time some 4,000 whites and 2,000 Chinese have been added. Mr. Petroff says rum has ruined the natives.

contract as a mining engineer, and left it in two or three months.

ALASKA.—The *Bulletin* of the National Geographic Society, Vol. III., pp. 53–204, is devoted to Mr. Israel C. Russell's report of his exploration of Mount St. Elias, in 1890. Twenty pages are taken up with a survey of previous work in the same region and the narrative begins at p. 75.

The expedition was organized under the joint auspices of the National Geographic Society and the United States Geological Survey, but was greatly assisted by individuals; and the credit for securing the necessary funds belongs to Mr. Willard D. Johnson. The report shows that all the members of the party worked with interest and enthusiasm, and Mr. Russell himself seems to have been strongly impressed by the magnificence of the scenery in the neighborhood of the St. Elias range.

Of the results he says: "The work planned at the start was carried out almost to the letter, with the exception that snowstorms and the lateness of the season did not permit us to reach the summit of Mount St. Elias."

He determines three well-defined formations in the region:

1. The sandstones and shales about Yakutat Bay and westward along the foot of the mountain to Icy Bay. This is named the *Yakutat system.*

2 A system of probably later date, composed of shale, conglomerate, limestone, sandstone, etc., best exposed in the cliffs of Pinnacle pass and along the northern and western borders of the Samovar hills, and named the *Pinnacle system.*

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3. The metamorphic rocks of the main St. Elias range. These are called the *St. Elias schist.*

There are two groups of glaciers, the *Alpine*, of the Swiss type, and the *Piedmont glaciers*, by which name Mr. Russell designates the plateaux of ice along the ocean. This type is represented by the Malaspina glacier, which has an area of between 500 and 600 square miles and a surface elevation in the central part of between 1,500 and 1,600 feet.

With regard to the height and position of Mount St. Elias, Mr. Russell says: "It was intended that Mr. Kerr's report, forming Appendix B, should contain a detailed record of the triangulation executed last summer, but a careful revision of his work by a committee of the National Geographic Society led to the conclusion that the results were not of sufficient accuracy to set at rest the questions raised by the discrepancies in earlier measurements of the height of Mount St. Elias." . . .

The *Bulletin* is illustrated by a number of well executed plates.

MR. SETON-KARR'S MAP OF THE CHILCAT COUNTRY. —Dr. Aurel Krause contributes the following note to the *Deutsche Geographische Blätter, Band XIV, Heft* 2.

"The statement, which I made in the last number of this journal concerning the travels of Seton-Karr in Southern Alaska, has called forth an answer in the May number of the *Proceedings* (Royal Geographical Society), in which it is affirmed that Mr. Seton-Karr copied his map, not directly from that of my brother, but from Dawson's map (1888). On Dawson's map, however, not only is it expressly mentioned that the drawing of

the Chilkat River and the pass leading from it to the Yukon is taken from my brother's map; his route is also laid down as a dotted line along the Wellesley—(Tlehini)—river, discovered (!) by Mr. Seton-Karr, to the Heywood Pass, discovered (!) by Mr. Seton-Karr, and beyond that northwards to the confluence of the Yukon.

"For the rest, I refer to my first communication, from which I have not a word to take back."

BERLIN, MAY 12, 1891.

Mr. Seton-Karr says, in the *Proceedings*, R. G. S., for February, p. 76:

"From Klokwan I followed the Chilcat River upwards to its junction with a large stream, which I named the Wellesley River. I found afterwards that it had an Indian name—Klaheena."

When he has occasion to mention this river in subsequent pages, he calls it sometimes Wellesley, sometimes Klaheena; and in his letter, published in the BULLETIN of this Society for June, he disavows the intention of claiming the discovery of the river.

Of Heywood Pass (so named on his map) he says in *Proceedings*, R. G. S., February, p. 83:

"The other two . . . . succeeded in reaching, in company with some Indians who were going in that direction, a branch of the Altsehk other than that which leads from the more direct pass, which I may claim to have discovered."

NAVASA ISLAND.—This island, variously called *Navassa*, *Navaza* and *Navaze*, lies in the southern part of the Windward Channel, between Haiti and Jamaica. It is

described in Publication No. 63 of the U. S. Hydrographic Office, as follows:

"Navassa island is 2 miles long NE. and SW. and 1 mile wide; it lies W. ¾ N. from Cape Tiburon, 28 miles distant, and has a uniform height of about 300 feet. Its surface is nearly level, with steep, sloping sides, terminating all round in bold perpendicular white cliffs about 20 feet high.

"The island is inaccessible, excepting at the landing platform on NW. side of the island, used for the shipment of guano.

"The island is of volcanic origin, composed of limestone interspersed with veins of sharp honeycombed rocks of iron pyrites. The spaces between the rocks are filled up with guano, which in some places is 14 feet deep.

"With the exception of the NW. extreme, which is a prominent bluff, a narrow ridge, about 15 feet high above the cliffs and a cable broad, extends all around the island. The summit is clothed with stunted palm-trees and cactus, and is inhabited by iguanas and numerous flocks of sea-birds.

"The island is surrounded by a bank of soundings from ⅓ to ¾ of a mile broad. On the N. and E. sides the bottom is rocky, and the depth from 18 to 40 fathoms. On the W. side the bottom is fine sand with small shells, and anchorage will be found sheltered from the usual trade winds in 16 fathoms of water, good holding ground, with the NW. bluff bearing N. or N. by E., and the SE. point ESE. about ½ a mile off shore; but a heavy swell sets round the SE. end of the island, and the current generally to the NW. The wind seldom

blows from the westward. From the NW. end of the island a coral ledge with 4½ fathoms of water on it extends a cable off.

"The NW. point is assumed to be in lat. 18° 25′ 10″ N., lon. 75° 2′ W."

This description seems to show that Navasa Island is not the best place in the West Indies for a naval station.

OROZCO Y BERRA.—The latest *Boletin* of the Mexican Geographical and Statistical Society (4ta Epoca, Tomo II, Nums. 1 y 2) has an account of the Memorial Session of the Society, held on the 31st of December 1889, in honor of Manuel Orozco y Berra. At this session the chair was occupied by President Diaz, and all the proceedings testified to the sense of the national loss in the death of a man, no less remarkable for the solidity and simplicity of his character than for his learning and his unwearied industry. A scholar and a man of science, he wrote on many subjects, but his attention was chiefly given to the history and the geography of Mexico. He had filled many positions of responsibility and of dignity as Professor of Mathematics, of Geography and History, of Mexican History, as Minister of Public Works, as Director of the National Archives and Director of the Museum, and as Member of the Supreme Court; but he never sacrificed to Fortune, and he died in poverty and forgotten, though not without leaving behind him, in the words of the *Comision de Publicaciones*, "a most precious treasure, his works to his fatherland and to his family his unstained integrity."

THE LIMA GEOGRAPHICAL SOCIETY.—The *Sociedad*

Geográfica de Lima was founded by decree of February 22, 1888; but its effective organization dates from April 15, 1891, when its "official life" began with the publication of its first *Boletín.*

The Society forms a public office under the Ministry of Foreign Relations, and its existence is assured by an appropriation from the Treasury.

The *Boletín*, which contains 40 pages, is published monthly, and is devoted to the study and description of Peru, under its physical, moral and economical aspects.

The second number, dated May 15, has a monograph, written in 1886 by the naturalist Raimondi, lately deceased, on the phenomenon known as the *Callao Painter*, or *Barber*. (*El Pintor*, and *Aguaje*, in Spanish.)

This phenomenon is observed at Callao during the summer months, from December to April. It consists of emanations of sulphuretted hydrogen gas, accompanied by changes in the color of the sea-water. The English names, and the Spanish *El Pintor*, arose from the effect produced by the gas upon white paint, which becomes blackish, like the tint of oxidized silver.

The *Callao Barber*, first noticed, according to Raimondi, by Lieutenant Woolridge, of the British Navy, in 1847, is quite fully described by Hutchinson in his *Two Years in Peru*, London, 1873, Vol. 1, p. 219. Hutchinson attributed the emanation of the gas to submarine volcanic action; "knowing," he says, "that the whole coast of Peru is supervolcanic, as well as believing that Callao Bay has been the crater of an extinct volcano." He prints the results of an analysis of the Callao sea-water, a bottle of which, containing some mud from the bottom of the bay, was sent to London, and analyzed

by Mr. T. Keates, Consulting Chemist to the Metropolitan Board of Works. After the water had been decanted, Mr. Keates found the black mud in a state of active decomposition, giving off large quantities of sulphuretted hydrogen gas, as well as sulphate of ammonia.

He says: "This mud appears to be ordinary river mud, or silt deposited at the mouth of a river, and lying in sea-water. It contains a considerable quantity of vegetable and some animal matter, and under the microscope shows abundance of diatomaceous remains."

Mr. Hutchinson took notes of the appearance of the bay water, in January, on four occasions. The water was, at first, ochre-brown, with a reddish tinge and opaque, and filled with animalcules of a circular form and colored like the water. Twelve hours after, the water was dark green and thick, with many animalcules shaped like an hour-glass. Fourteen to sixteen hours later, when the *Painter* smell was most nauseating, the water was of a muddyish white, and no animalcules were visible under the microscope. The fourth observation showed the water under its ordinary conditions.

Raimondi remarks that the changes of color do not always accompany the manifestation of the *Painter*. April 28, 1885, the water was so foul near the head of the wharf that many fishes, swimming near, perished; but there was no reddish discoloration of the water. This reddish color simply denotes the presence of infusoria brought in from the open sea. When these enter the harbor during the prevalence of the *Painter*, they die and, in a measure, add to the offensiveness of the odor.

The *Painter* is not peculiar to Callao. Raimondi's in-

vestigations proved that it shows itself at various points on the coast between Pisco (S. Lat. 13° 42′ 42″) and Paita (S. Lat. 5° 5′ 30″), and at Pacasmayo (S. Lat. 7° 24′ 20″), where the phenomenon is known by the name of *Salgaso*, the fish die in the poisoned water by thousands.

Raimondi rejects the theory of a volcanic origin for the gas. There is no foundation for the belief that the Bay of Callao is an extinct crater. On the contrary the formations are all alluvial in character, and the work for the construction of the quay showed that the bottom of the harbor was a bed of clayey mud about 20 feet in thickness.* Some have thought that the *Painter* was produced by an occasional strong current from the North, setting into the comparatively shallow harbor and stirring up the drainage from the city. The *Painter* occurs, on the contrary, when the current is from the South.

It has been suggested that the phenomenon is due to the quantities of organic matter brought down by the river Rimac in the freshets, which take place in the summer. While these freshets certainly contribute to the *Painter*, they are not of themselves sufficient to explain it; for then there would be a *Painter* at every point where a river emptied into the sea. Neither can it be admitted that the decomposition of matter from the city drains is the all-producing cause; for, if it were, there would be a constant, and not a periodical, manifestation.

* The Encyclopædia Britannica, Ninth Edition, *art.* CALLAO, says, without quoting its authority: "the borings for the new works discovered the cause of this (the *Painter*) to be in strongly impregnated springs forcing their way up through a stratum of clay and mud." The discovery does not explain, however, why these springs regularly cease working in April and begin again in December.

XUM

Without making a final decision, for which the data are still wanting, Raimondi finds that certain conditions must exist simultaneously and co-operate in order to produce the *Painter*. There must be a marine current setting along the coast from South to North, a point or a chain of highlands projecting into the sea, and to the north, at no great distance, the mouth of a river. The Humboldt Current, passing the extremity of the point at Callao, flows right on without turning into the bay, while the water of the Rimac, flowing out, encounters the Current, and the mass of back-water, held on the north side of the point, is exposed, with all that it holds in suspension, to the full power of the tropical sun.*

Where there is no obstruction to shut off the current, as in that part of Callao exposed to the force of the waves and known by the name of *Mar Brava* (Rough Sea), there is no disengagement of gas. Where the river is wanting, as at Chorrillos and at Ancon, both protected against the southern current, the *Painter* is unknown. Paita is the extreme northern point at which the phenomenon has been observed, and it is at Paita that the Humboldt Current turns away from the coast.

THE SWITZERLAND OF THE NORTH.—This appears to be, according to *L'Esplorazione Commerciale*, of Milan, for June, and *La Geografia per Tutti* of Bergamo, for July 31, the recognized appellation of Finland, a region "remarkable for its wild and picturesque mountains." It seems ungracious to pass by Denmark and Prussia, in the search for a Switzerland of the North, but wisdom is justified of her children.

* The summer temperature at Callao is about 20° (Fahr.) higher than the winter.

The Finns are as picturesque as their country: "The most affectionate and expansive cordiality prevails among the inhabitants, who embrace each other readily and frequently. The distinguishing mark of the Finlander is generally a red nose." * Was Bardolph a Finn?

What is the glory of Alp or of Apennine, compared with that of a land glowing with perpetual triumphs and everlasting bonfire-lights?

THE GIRONDE.—Mr. A. Hautreux, in the *Bulletin* of the Bordeaux Geographical Society, No. 12 for 1891, has an article, illustrated by 8 double size maps, showing the mouth of the Gironde, at as many epochs.

These maps are:

One of 1590, from the *Miroir de la Mer*, inexact as to distances, but full of interest. This map has a sketch of the Cordan tower before its reconstruction.

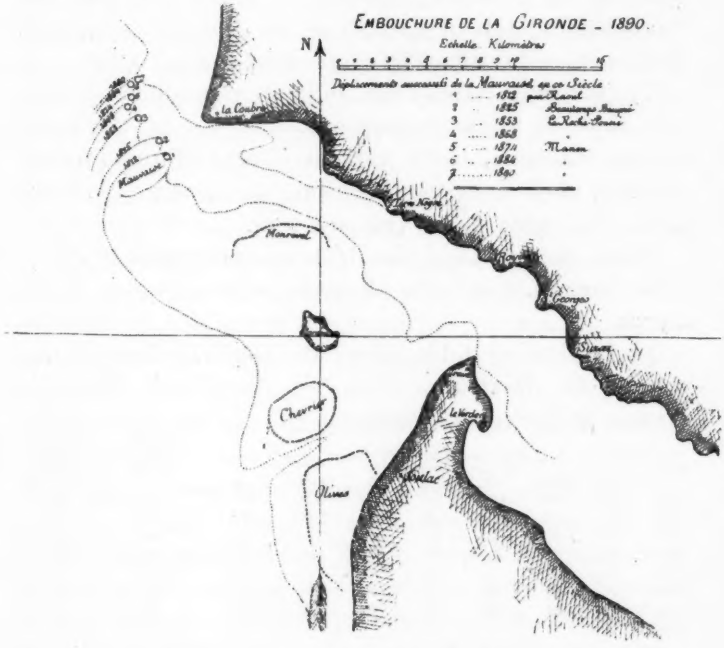
One of 1677, reduced from a chart in the Ministry of Marine. This is exact from every point of view, and shows the bank *La Mauvaise* 7 kilomètres (4.35 miles) N. W. of Cordouan, with its great light-house.

One of 1680, traced from that in the *Flambeau de la Mer*. This is inexact as to distances, but contains directions for entering the port.

One of 1751, reduced from Bélin's chart. In this also the distances are incorrectly given, but it shows the advance of *La Mauvaise* towards the N. W., and the commencement of obstruction in the pass of *Le Mattelier*.

* Fra gli abitanti regna la cordialità più affettuosa ed espansiva: ci si abbraccia facilmente e di frequente. Il Finlandese ha comunemente quale marca particolare il naso rubicondo.—*L'Esplorazione Comm., Giugno, p. 232.*

One of 1798, reduced from the chart by Teulère. Incorrect in measurements, but records the opening of the *Fasse du Nord*, the continued displacement of *La Mauvaise* and the increased accumulation of the sands, west of Cordouan.



FROM THE BULLETIN No. 12, 1891 OF THE SOC. DE GEOGRAPHIE COMM. DE BORDEAUX.

One of 1812, reduced from Raoul's chart. This is very correct and, in the original, full of detail. It shows the final closing of the *Le Mattelier* pass and the deepening of the *Passe du Nord.*

La Mauvaise lies directly south of *La Coubre*, and

14 kilomètres (8.7 miles) from Cordouan; so that the bank had advanced 7 kilomètres (4.35 miles) since 1677, or about 50 mètres (164 feet) a year.

One of 1874 reduced from a hydrographic reconnoissance by Manen. It shows the continued movement of *La Mauvaise* toward the N. N. W., and the diminished depth of the *Passe du Nord*, a condition that increased during the succeeding years.

The last map, dated 1890, and here reproduced, brings into view the different positions, occupied by the bank of *La Mauvaise*, at the various epochs of the present century, until it is found closing in upon and uniting with *La Coubre* during the past year.

From 1812 to 1890 *La Mauvaise* advanced in all 5 kilomètres (3.11 miles); about 60 mètres (196.85 feet) a year.

The following table gives the depth in feet of the passes, *Le Mattelier*, *Passe du Nord* and *Passe de Graves*, at the several dates:

Year.	Passe du Mattelier Cordouan bearing.							Passe du Nord.	Passe de Graves.
	E.	ESE.	SE.	SSE.	S.	SSW.	SW.		
1590	65	70	100	90	100	110	110	9	15
1677	75	55	80	90	75	63	70	10	11
1680	50	50	50	50	100	100	50	20	20
1751	24	30	54	60	60	40	55	10	15
1798	40	33	33	90	48	57	63	30	15
1812	40	18	25	60	100	80	75	35	21
1874	45	21	30	60	90	75	60	27	15
1890								24	

This record of three centuries establishes two important facts: the stability of the *Passe de Graves*, which is east of Cordouan, and the continual movement in one direction of the sands to the west of Cordouan.

Observatory on Mont-Blanc.—Mr. Jansen, who was carried up Mont Blanc in the summer of 1890, has

begun the work of constructing an observatory on the top of the mountain. The engineer in charge is M. Imfeld, and he tells of his difficulties in a letter to a Zurich paper. He is staying with eight workmen and two doctors at M. Vallot's cabin which is at an elevation of 4,400 metres (14,436 feet), and they proceed daily to the summit, where they work for several hours. M. Imfeld says that he has encountered traces of a ridge of rock eighteen to twenty metres (60 to 65 feet) below the summit, and covered with about one metre of snow. He has begun to make a series of tunnels on three sides, twelve metres (39 feet) below the summit, to ascertain if the ridge extends to that height. The men suffer from the rarefied air. In spite of coke stoves, the thermometer of the cabin never rises above zero; ink freezes, and water boils at 83° (centigrade scale; zero=32° Fahr., 83°=181°.4 Fahr.). To cook meat is impossible.

The workmen are discouraged, three of them having had hands and feet frostbitten. M. Imfeld increased their pay, but one man refused to remain. One night in August twenty inches of snow fell. August 21, M. Rothe and a guide named Simon slipped into a crevasse and were lost; and all the workmen were so alarmed by this accident that they quit work and M. Imfeld had to descend to Chamounix to engage others. In searching for the bodies of Rothe and Simon tunnels were dug at a depth of 10 metres (33 feet) below the edge of the crevasse, and the men found great difficulty in breathing. On Tuesday (August 25) they discovered a piece of cord 5 metres (16 feet) in length. They sent for help and twelve men started that night for

the scene of action. The next day the bodies were recovered.

VOYAGE ON THE DANUBE.—The following letter, addressed to the President of this Society, tells its own story:

CANOE "CARIBBEE," ON THE DANUBE, JULY 21, 1891.

Dear Sir:

As a Fellow of the American Geographical Society I beg to report to your committee that I am at present making, in company with F. D. Millet of New York and Alfred Parsons of London, a voyage in an American-cruising-sailing and paddling-canoe from the source to the mouth of the Danube; sleeping each night in our 3 boats, cooking for ourselves and seeking so far as possible to study the condition of the countries we pass at very close quarters.

We have thus far reached the Hungarian border after passing through territory of Baden, Wurtemberg Prussia, Bavaria and Austria, and have before us Servia, Turkey, Roumania and Russia. If the cruise ends successfully it will, so far as I know, be the first consecutive voyage of the kind ever made on this river. I am, yours respectfully, POULTNEY BIGELOW.

THE IONIAN SEA.—Guido Cora's *Cosmos*, Vol. X, No. 7, presents in a table, illustrated by a colored map, the complete result of the soundings made in the Ionian Sea, in 1886–1887, by the steamer *Washington*, of the Italian Navy, under the command of Captain (now Rear-Admiral) Magnaghi.

The first eight soundings were taken in May, 1886,

the rest in August, 1887. The longitude is calculated from the meridian of Greenwich, and the depths are in mètres. The three measurements of 4,055, 4,057 and 4,067 mètres (the last the greatest depth, 13,343 feet, yet found in the Mediterranean) occur within an area, to which Mr. Cora has given the appropriate name of the Abisso Magnaghi.

Lat. N.	Long. E.	Depth	Bottom.	Lat. N.	Long. E.	Depth.	Bottom.
38° 11′ 00″	16° 51′ 15″	1594	mud	38° 21′ 30″	18° 08′ 40″	2673	mud
38° 25′ 00″	17° 23′ 00″	1738	"	38° 58′ 00″	17° 52′ 00″	2080	"
38° 35′ 00″	17° 49′ 05″	1800	"	39° 11′ 50″	17° 44′ 10″	1800	"
38° 44′ 00″	18° 15′ 00″	2497	"	39° 32′ 55″	17° 36′ 30″	1669	"
38° 53′ 00″	18° 35′ 00″	2451	"	39° 55′ 20″	17° 24′ 30″	1675	"
39° 11′ 00″	18° 45′ 00″	1091	"	40° 12′ 30″	17° 17′ 10″	820	"
39° 33′ 18″	18° 55′ 50″	835	"	37° 57′ 25″	17° 04′ 20″	1810	"
39° 49′ 50″	19° 16′ 28″	1065	"	37° 57′ 35″	17° 16′ 30″	1565	"
36° 22′ 00″	16° 02′ 30″	3315	mud & sand	37° 57′ 20″	17° 29′ 30″	1890	"
				37° 57′ 00″	17° 40′ 40″	2664	"
35° 52′ 25″	18° 18′ 30″	4067	mud	37° 57′ 25″	17° 54′ 30″	2710	"
35° 39′ 40″	18° 38′ 00″	4055	"	37° 57′ 35″	18° 01′ 15″	2611	"
36° 03′ 10″	18° 36′ 40″	4057	"	37° 58′ 15″	18° 09′ 00″	2530	"
36° 30′ 00″	18° 28′ 00″	3976	"	37° 59′ 50″	18° 40′ 15″	3227	"
36° 56′ 30″	18° 22′ 30″	3835	"	37° 55′ 20″	18° 18′ 50″	3066	"
37° 28′ 40″	18° 18′ 30″	3116	"	37° 41′ 30″	18° 01′ 50″	2792	"
37° 56′ 55″	18° 12′ 10″	2620	mud & rock	37° 26′ 20″	17° 43′ 50″	2733	"
				37° 17′ 00″	16° 37′ 15″	2681	"

EGYPTIAN IRRIGATION.—Mr. Scott Moncrieff, Under Secretary of State, Public Works Department, Cairo, writes to *Nature*, of June 18, on the subject of irrigation in Egypt.

He makes two broad subdivisions of his subject: the irrigation effected by the Nile flood when there is rich muddy water in abundance for a land thrice as big as Egypt; and the irrigation effected by the Nile at its lowest in May and June, when the water surface is 20 feet below that of the field, and "when it is only by the

strictest economy that we can water an area not exceeding one-fourth of the whole of Egypt."

The first irrigation is the ancient art, practised since the time of the Pharaohs. Its products are wheat, barley, beans, maize and rice.

The second system was introduced by Mohammed Ali, for the cultivation of sugar and cotton. It required deep canals, and the raising of the water in the river for diversion into them by a Barrage, or dam, at the apex of the Delta. This Barrage was constructed at a cost of £2,000,000. Soon after completion it cracked; and, from 1867 to 1883, it was practically useless. The network of canals was cleared every year to about 20 feet below the level of the land, and forced labor was employed upon the work for six months out of the twelve.

The Egyptian Government gave up the hope of using the Barrage. A contract was made for the irrigation of the Behera province by pumps, at an annual cost of between £50,000 and £60,000, and a similar arrangement was considered for the rest of the Delta, at an initial cost of £700,000 and an annual one of £250,000. No attention was paid to the drainage necessary for Lower Egypt, and in Upper Egypt there was a loss of revenue amounting to £38,000 a year, even in years of average Nile flood.

The English took charge of the irrigation in 1884, and to the question, frequently asked, whether there has not been, since then, a great addition to the cultivated area of Egypt, Mr. Scott-Moncrieff replies in the negative. Some extension there has been, notably to the west of Behera and in the Fayûm; and one much

more important is in progress along all the north of the Delta, where marshes and lagoons are reclaimed by drainage.

The cultivated area of Egypt is about 5,000,000 acres. The area of the lagoons is 1,280,000 acres, and it is expected that at least half of this land will be reclaimed in a very few years.

What the English have done, are doing, and propose to do in future years, is as follows :

The Barrage has been completed and placed in a condition to fulfil its original purpose. From up-stream of it are derived three main trunk canals, which irrigate the whole Delta, and three smaller canals which irrigate all the country north-east of Cairo and to the south of Zagazig ; one of these takes water to Port Said and Suez. The outlay on the Barrage has been, since 1884, about £460,000. The Tewfikieh Canal, supplying the East Delta, has been made since 1886, at a cost of £372,000.

The Barrage diverts the whole summer supply of the Nile into these canals. So long as there is water in the river, it is under control, and the great cotton crop will be secured.

The Barrage has very largely increased the area of land that produces cotton, and since 1884, when it began to be used, the average annual yield of cotton has been 333,893 Kantars (15,000 tons) greater than in the five years preceding 1884. This makes a value of £835,000 a year, exclusive of the cotton-seeds.

Two main canals, one roughly parallel to each branch of the Nile, have been fitted with locks and rendered navigable ; and through these, when finished, laden boats will be enabled to pass freely between Cairo and

Alexandria on one side, and Cairo and Damietta on the other, at all seasons of the year.

Other locks have been built, and obstructions have been removed.

Year by year drainage arteries have been opened, and in Behera, Gharbieh, Dakahlieh, Sharkieh in Lower Egypt and in the Fayûm, large tracts have been reclaimed and now yield good crops. There are 1500 miles of drains, and the Budget for 1891 contains £140,000 for new drainage works in Lower Egypt.

The annual loss, already mentioned, of £38,000 in average years in Upper Egypt, where the Nile flood did not reach all the fields, has been very greatly exceeded in exceptional years. In 1877, the loss amounted to £1,111,880, and after 1888 it was about £300,000. Col. Ross, Inspector-General of Irrigation, has proved that by a judicious system of canals, sluices, siphons, escapes, weirs, etc., it may be arranged that, even in the worst years, the whole Nile valley shall receive its share of mud-charged water. This involves the construction of a great number of works costing from £5,000 to £15,000 each, built often in remote spots, where construction of any kind is difficult. These works have been going on for more than a year, and will probably be finished in 1893, at a total cost of about £600,000.

Until 1889, it would have been impossible to take a cart-load of agricultural produce from any one centre of population to another in the Delta. Riaz Pasha effected a reform, and now a whole network of serviceable roads is being made, with a fund raised by a tax of 4 or 5

Egyptian pounds (as many guineas) per *feddan* (about 1.1 acres) for one year only.

Before 1885, the work on the clearance and repairs of the canals and embankments was performed by the forced labor of the peasantry. This labor amounted in 1884 to 85,000 men's work for 160 days. It was estimated that to redeem this *corvée* and pay for all this labor would cost £400,000. Nubar Pasha, in the face of the greatest financial difficulty and opposition, managed to give an annual grant of £250,000 for the object; and Riaz Pasha, at the end of 1889, found the means of raising the remaining £150,000; and in 1890, for the first time perhaps in all history, there was no *corvée* in Egypt. A Canal Act has been passed but, unfortunately, its provisions are not binding on residents of foreign nationality.

A problem pressing for solution is that of providing means for the storage of the surplus Nile flood. There are two ways in which this may be done. The first is Mr. Cope Whitehouse's plan for diverting a portion of the flood into the great natural depression to the west of the Nile valley, and there forming a storage reservoir. The expense would be about £1,500,000. The alternative project, now being studied, is to pond up water in the valley of the river above Assûan. "There can be hardly further extension of the cotton cultivation," says Mr. Scott-Moncrieff, "if one or the other of these schemes is not executed. There is room enough in the country to employ both."

COLONEL WILLIAMS AND THE TEMPLE OF DELPHI.—Col. George W. Williams, an American who pointed

out, in a letter addressed a year ago to the King of the Belgians, a number of alleged abuses in the administration of the Congo Free State, died in July last in London. *Le Mouvement Géographique* (Brussels) of August 9 refers to the event in these words: "The American traveller who, under the name of Colonel Williams, published in these latter days calumnious attacks upon the Congo, attacks which were here treated as they deserved, has just died in London. Mr. Williams had his moment of celebrity after the fashion of Erostratus, the incendiary who fired the Temple of Delphi."

Le Mouvement Géographique publishes none but "real and genuine news" (number of August 9, p. 74, *Postscriptum*), and its editor will be glad to learn that Colonel Williams wrote under his own name and honestly believed what he wrote. He may have been misinformed about the Congo Free State, but he had studied history and geography to some purpose, and he never would have gone to Delphi to look for Herostratus and the Temple of Diana at Ephesus.

PTOLEMY'S EASTERN NILE SOURCE, THE VICTORIA NYANZA.—Dr. Konrad Ganzenmüller, in a learned article in the *Zeitschrift für Wissenschaftliche Geographie, Bd. VIII, Heft 1*, seeks to show that the Ukerewe, or Victoria Nyanza, was known to Ptolemy as one of the two lakes from which the Nile took its rise; that, under the name of the Lake of the Crocodiles, it is described by an unknown Greek writer of the 5th, or the 6th, century; and that it is the Kura Kavar of the Arab writers. For Ptolemy himself Dr. Ganzenmüller entertains the deepest respect. He admits that the great geographer

speaks almost wholly in names and numbers; but it is added, very truly, that those names and numbers are the expression of his thoughts, and that if we would comprehend these we must learn to understand his manner of speech, and must not presume to believe, with a recent writer on the history of ancient geography, that "his latitudes and longitudes are clearly worthless."*

Ptolemy calculated the length of a great circle at 180,000 stadia. The stadium contained 600 Attic,= 610 English feet; and 40 stadia would about equal a geographical mile.† He makes the circumference of the globe smaller than it is; but his longitudes can be brought into substantial agreement with the fact, if reduced by one-sixth; though the differences are found to increase in advancing from the west to the east. The longitude of Carthage is, according to Ptolemy, 34° 50′, deducting the sixth, 29° 2′ E. of Ferro; while its true position is 27° 40′, and the error is, therefore, only 1° 22′. Alexandria, placed under 60° 30′ (50° 25, after deduction of the sixth), lies under 47° 40′ and the error amounts to 2° 45′. Farther east, Susa has the longitude of 84°, corrected to 70°; its true longitude being 66° 30′, and the error 3° 30′. Following the indications of these examples and applying them to the position assigned by Ptolemy to the eastward lake of the Nile sources under the meridian of 65°, Dr. Ganzenmüller brings this, by deduction of a sixth, to 54° 10′, and then, by allowing 3° for the error from west to east, to 51° 10′ E. from Fer-

* The quotation is from Bunbury's *History of Ancient Geography among the Greeks and Romans from the Earliest Ages to the Fall of the Roman Empire: Vol. II, p. 614.*

† Dr. Ganzenmüller makes the geographical mile equal to 4 minutes.

ro, which agrees with the true position of the Ukerewe, or Victoria Nyanza, between 49° 25′ and 52° 25′ (31° 45′ and 34° 45′ E. from Greenwich).

This is, so far, satisfactory, but it does not restore the authority of Ptolemy. Not only does he make the circumference of the globe too small; he fixes the position of his prime meridian at least 7° too far to the east, and he gives the longitude of places, not according to observation, but by estimates of travel on land or by sea. He makes the Mediterranean 800 miles longer than it is; and what could he hope to measure, if not the Mediterranean? The elements of error in Ptolemy's figures are complicated, and Mr. Bunbury's language with regard to them is fully sustained by Delambre: "Here is more than enough to convince every unprejudiced reader that the geography of the ancients offers no one position upon which we can count. The latitudes are not always exact within a degree. Their longitudes could not have been determined within two degrees, except by an extraordinary chance. Errors of three and four degrees are not rare in the same country, and there are others much more serious, between one country and another. Chorography may derive some fruit from the study of the ancients; but for absolute positions, there is not a single one in which I should be disposed to have the smallest confidence, unless it were found to be confirmed by modern observations; and, in this case, a determination due to chance will never be anything more than a simple object of curiosity."*

* En voici plus qu'il ne faut pour convaincre tout lecteur non prévenu, que la Géographie des anciens n'offre aucune position sur laquelle on puisse compter. Les latitudes ne sont pas toujours exactes à un degré près. Les longitudes n'auraient

This first part of Dr. Ganzenmüller's essay is less important than the argument to which he mainly addresses himself, the knowledge, that is, of the existence of the Nile sources by Ptolemy and the anonymous writer of the 5th or 6th century, as well as by the Arabs.

It cannot be said, indeed, that he proves his case, because the evidence is not of such a character as to compel its acceptance by an unwilling mind, but he does make it clear that Ptolemy placed the great lakes of which he had heard in something like their true position. Mr. Ravenstein (*Scottish Geographical Magazine, June, 1891*) makes short work of this approximation by *assuming* (it is his own word) that Ptolemy found the lakes correctly placed by Marinus somewhere in the northern Somal country, and "swept them far into the Interior"; a summary process which Mr. Ravenstein imitates when he affirms that Ptolemy "cannot even have read such standard authors as Strabo and Pliny."

The probabilities are in favor of Dr. Ganzenmüller's conclusion that the Kura Kavar of the Arabs is none other than the Ukerewe Nyanza, and that it is identical with Ptolemy's eastern lake of the Nile sources and with the Crocodile Lake of the anonymous Greek writer.

THE CAPTURE OF WADELAI.—The following intelligence was published in some New York papers of August 24 and 25:

pu être fixées à 2° près, sans un hasard assez extraordinaire. Les erreurs de 3 à 4° ne sont pas rares dans une même contrée et il y en a de bien plus fortes d'un pays à l'autre. La Chorographie peut retirer quelque fruit de l'étude des anciens; mais pour les positions absolues, il n'y en a pas une seule à laquelle je voulusse accorder la moindre confiance, à moins de la trouver confirmée par les observations modernes; et dans ce cas, une détermination, due au hasard, ne sera tout au plus qu'un simple objet de curiosité.—*Histoire de l'Astronomie Ancienne, Tome II, p. 542.*

"BRUSSELS, August 24.—A communication in cipher has been received here from Stanley Falls, which indicates that Emin Pasha has been wonderfully successful in his operations in Africa. According to this despatch, Emin Pasha, at the time the message was sent, was resting at Wadelai, after having inflicted a thorough defeat upon the Dervishes.

"As a result of this battle he captured 6,000 tusks of ivory and a quantity of ammunition, arms and stores of many descriptions, and has re-occupied all the old stations in the Equatorial Province, and seems to have completely cowed the Dervishes."

The original appeared in a full-page supplement to *Le Mouvement Géographique* of August 23, as one of two communications received that day from "San Thomé." The head-lines of these communications read:

1. "The Germans on the Upper Nile—Capture of Wadelai by Emin Pasha—Defeat of the Dervishes at Doufilé—A treasure of 6,000 elephants' tusks—Death of Omar Saleh—The former province of Emin under the German protectorate.

5. "The Exploration of the Katanga—Junction of the Delcommune and LeMarinel expeditions—Imprisonment of the Missionary Arnot—Great battle against 3,000 natives—Defeat and death of Msiri—The caverns of Mkouamba—Discovery of mines of gold and mercury."

On p. 79 of the paper appears, at the bottom of the third column, this statement:

"OUR SUPPLEMENT.

"We add to this number a supplement, giving the text of two reports from Stanley Falls.

"This number is a vacation freak. The two despatches are false. They were fabricated at Brussels by us.

"In composing them we wished to prove that we also, quite as well as the telegraphic agencies, are in a position to publish sensational news concerning events which never happened.

"If any are tempted to contradict our despatches, we shall answer by telling them to wait for three or four months.

"In fact, our two announcements cannot possibly be contradicted for at least three months. Between this time and that, nobody will think of them any more, and we shall have bought very cheaply the luxury of beating all our rivals in the unexpectedness, the rapidity and the abundance of our advices.

"It will be remarked that the two despatches give good news. We could just as well have fashioned them in the doleful style, but we leave that specialty to those who do not shrink from such methods."*

This confession of sin is printed in small type, with other trifles, in a corner as far as possible from the Sup-

* NOTRE SUPPLÉMENT.—Nous joignons à ce numéro un supplément donnant le texte de deux dépêches des Stanley-Falls. Ce numéro est une fantaisie de vacances. Les deux dépêches sont fausses. Elles ont été fabriquées à Bruxelles par nous. En les rédigeant, nous avons voulu démontrer que nous aussi, ni plus ni moins que les agences télégraphiques, nous sommes à même de publier des nouvelles à sensation sur des événements qui ne se sont pas passés. A ceux qui seraient tentés de nous démentir nous répondrons en leur disant que nous les renvoyons à trois ou quatre mois.

En effet, nos deux nouvelles sont indémentables pendant au moins trois mois. D'ici là, plus personne n'y songera et nous nous serons payé à bon marché le luxe de battre tous nos concurrents par l'imprévu, la rapidité et l' abondance de nos informations. On remarquera que les deux nouvelles sont bonnes. Nous aurions tout aussi bien pu travailler dans le genre lugubre, mais nous laissons cette spécialité à ceux qui ne reculent pas devant de tels procédés.

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plement to which it relates. The display of the fabrication and the modesty of the correction betray their relative nearness to the mind of their author; and those who have hitherto attached a value to the words of *Le Mouvement Géographique* will surely not repeat their offence.

THE CRAMPEL EXPEDITION. — Paul Crampel left Brazzaville, in the French Congo, August 16, 1890, at the head of an expedition, to reach Lake Tchad. He had with him four Europeans, Messrs. Nébout, Biscarrat, Orsi and Lauzière, an Arab interpreter, a Targui* interpreter, and the young Pahuin girl Niarinzhe, as Fan interpreter; and his caravan was composed of 30 armed Senegalese, 95 natives of various tribes, and 128 carriers. He reached Bangui, the farthest French post, situated on the bend of the Ubangi, on the 25th September. The commander of this post, M. Musy, had been killed and eaten some months before, and Crampel's first care was to restore the authority of the French in the region. In December he plunged into the unknown country, and the last letter received from him, which bore the date of January 19, 1891, told of his safe arrival on the river Zuvanga.

The next news, through native channels, reported the death of Orsi and Lauzière; and then came the following telegram from M. de Brazza to the Minister of the Colonies: "According to the last tidings from M. Dolisie, at Brazzaville, Crampel, who had gone forward, was assassinated on the 9th of April, together with Mo-

* *Targui* is the singular of the word *Touareg*, the equivalent forms in English usage being *Touareg* and *Touaregs*, or *Tuaregs*.

hammed Ben Saïd, the Arab interpreter, and two Senegalese *tirailleurs*. Biscarrat, the commander of the escort, who had remained in camp, was also assassinated.

"The rear-guard retreated, under command of M. Nébout, who was in charge of the caravan. It arrived at the post of Bangui, from which place the gunboat *Oubangui* took it on board for Brazzaville, where it was to arrive July 16."

A second telegram dated at Libreville, August 16, and addressed to the *Comité de l'Afrique Française*, confirms the news of the disaster and gives all the information yet received. M. de Brazza says:

"The latest intelligence that has reached Loango from Brazzaville bears date July 27 and confirms all our fears. M. Dolisie writes to me as follows: 'Brazzaville, July 26. A Loango child, a servant of Ben Saïd, the Arab physician of the expedition, appeared before M. Biscarrat on the 23d of May and told him of the murder of M. Crampel and Ben Saïd. Mussulmans had come from from El-Coutil to the camp, to offer their services to M. Biscarrat as porters. They were in reality emissaries, and they were only waiting for the arrival of M. Nébout with the rear-guard to kill the two white men together. They saw that the child recognized them, and this precipitated their purpose. M. Biscarrat was struck down with a knife; the child was also killed, as well as a Kréuman. Thomas (?) is the only man who can tell the whole story.'

"We have as yet no explanation concerning M. Nébout's return. We are left in doubt as to the completeness of the disaster. The gunboat *Djoué* started for

Bangui on the 20th of July, with M. Brunache, commanding the advanced guard of the Dybowski expedition.

"He is accompanied by the post commander Bobichon and is going to establish a station 200 kilometres (125 miles) from Bangui, on the route travelled by Crampel. The connections with the Ubangi will be carefully watched. The gunboat *Alima* also left on the 20th, taking Messrs. Brégeot, Briquez and Fraisse and M. Nébout, who returns to the front.

"M. Dybowski wants to start at the end of August with a gunboat; and he hopes to reach El-Coutil.

"It is only at Bangui that he will be able to receive a telegram from you.

"All the posts on the Ubangi and the Sanga will be reinforced. Three agents, fifty soldiers and a hundred and sixty recruits have arrived. M. Liotard is on the way to the advanced post of Oubanghi. M. Fourneau has returned to Stamboul.

"The exploration of the Sanga is continued and directed towards the supposed point where the catastrophe of the Crampel expedition took place. We may perhaps have some information by this route.

"BRAZZA."

Another French expedition, under M. Fourneau, also on the march to Lake Tchad, has been attacked and repulsed with loss; and two German parties, under Zintgraff and Morgen, have also been driven back. These checks serve only to stimulate both French and Germans, and to deepen their determination to reach and possess a portion, at least, of the lands on the great lake of the Sudan.

It is evident that the difficulties of the enterprise have been underestimated, but it will be carried through in spite of obstacles; and, rivals as they are, the Europeans may find it to their advantage to act in concert.

THE ELDER EXPLORATION OF AUSTRALIA.—The expedition fitted out, under the auspices of the South Australian Branch of the Royal Geographical Society of Australasia, by Sir Thomas Elder, of Adelaide, at a cost of £10,000, made its start on the 22d of April, 1891, for the unknown region of Central Australia, a tract of 500,000 square miles in extent. The enterprise is the sixth of the kind to which Sir Thomas Elder has devoted his time and influence and his ample means; and the suggestion of it came, it may be thought, from a passage in the inaugural address delivered in January, 1890, before the Australasian Science Association, in Melbourne, by the President, Baron Ferdinand von Mueller. He said:

"Turning to geography, let here the question be asked, as concerning us most, how can Australian exploration be advanced? Talent, enthusiasm, and experience are available at any moment for the purpose. Our first historic century has passed; will the chronologic seculum also close ere the blanks on the map are filled up? If so, it would be almost a reproach; and may I be allowed to repeat, what in a geographic address was said some few months ago: 'The main work of Australian land exploration devolved on nine travellers only; now space seems only left for one more great explorer to rank with the nine. Who will be the tenth to carry off this last of honors, or will it be divided among several less ambitious competitors?' Well may the eagerness be understood, to set the life on winning such a prize."

The plan once conceived, Sir Thomas gave himself with energy to working out the details of its organiza-

tion with the Council of the South Australian Branch of the Geographical Society.

The Branches of Victoria and New South Wales actively co-operated, and the matured project is described in the following extract from the Adelaide *South Australian Register*, of April 22 :

"By this morning's early train to the North the members of the expedition fitted out by Sir Thomas Elder, G. C. M. G., under the auspices of the Royal Geographical Society of Australasia, will start on their journey to the Peake. Two of the members—Mr. David Lindsay, the leader, and Dr. Elliott, the medical officer—do not propose to leave Adelaide till Monday next.

"The principal members of the party have been appointed on the highest recommendations, including those of Baron von Mueller. Mr. Lindsay, the commander-in-chief, is certainly a well-tried explorer, and there is a general opinion that no expedition has gone forth better equipped for the perilous journeyings of the interior than the one which is about to start. Altogether there are fifteen in the expedition, including three scientific men, four Afghans, and an aboriginal lad. About forty-four camels will be taken on board the train at Farina, and the party will no doubt be well on their way next week.

"Of course in such an expedition only an approximate route of the explorers can be stated. Leaving the Peake the expedition will go by way of Mr. A. B. Murray's Cootanoorina Head Station, where they will pick up the black boy who is to accompany them in their travels. Thence the route will be to the Everard Ranges, and striking west they will enter upon the unknown territory which lies between the tracks taken by the exploration parties led by Gosse in 1873, by Forrest in 1874, and by Giles in 1875. The country to be examined here represents a tract some 1,300 miles in length, with an average width of about 300 or 350 miles, and not even the explorers themselves know anything like the route that they will take. Their movements will depend very much upon the situation of the waters. Six or seven months' stores will, however, be supplied for this part of the journey. A stores depot will be established at the head waters of the Murchison, in Western Australia, at either Darlot's or Hope and Moore's stations, the provisions being sent up from Geraldton. Six months' stores will most likely be taken up at the Murchison, and then the explorers will proceed northwards to the Fitzroy, going up between the tracks of Giles in 1876 and Warburton in 1873—a strip of country roughly estimated to be 900 miles in length and 200 in width. In the ex-

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ploration of the Kimberley country horses instead of camels will be used on account of the nature of the country to be explored. The next move will be into the Northern Territory to examine the land to the east of that explored by Warburton in 1873, Gregory in 1856, and Forrest in 1879. This is a patch of some 400 miles by 300 miles, lying between the Overland Telegraph Line and the Victoria River and Sturt's Creek, and it is in this region that Baron Von Mueller thinks there is a possibility of relics of Leichardt being found. At any rate Mr. Lindsay and his party intend to have a good search for some remains of this ill-fated explorer. The expedition will probably go south and northwards to Barrows Creek, and west and northwards to Daly Waters, and it is most likely that they will be asked to go on to the tableland to the eastward, and making south map in a few unexplored patches, and describe the country geographically. Stores depots will be established at Barrows Creek and elsewhere in the interior. After examining Northern Territory country and mapping some of the country that still remains a blank on the map, the expedition are expected to make their return journey to Adelaide along the eastern side of the Overland Telegraph line.

The members of the expedition are:

Mr. D. Lindsay, of Adelaide, leader.

Mr. F. W. Leech, of Adelaide, second in command.

Mr. L. A. Wells, of Adelaide, surveyor.

Dr. F. J. Elliot, of Townsville, medical officer and photographer.

Mr. V. Streich, of Adelaide, geologist, mineralogist, etc.

Mr. R. Helms, of Sydney, naturalist, entomologist, etc.

Messrs. R. G. Ramsay, of Adelaide, A. P. Gwynne, of Adelaide, C. A. Bowden and A. Warren, assistants.

The leader (Mr. D. Lindsay, F.R.G.S.), the commander of the expedition, is a son of the late Captain John Lindsay, and was born at Goolwa, South Australia, in June, 1856. Having explored the Mary River he proved that this was the stream which John McDouall Stuart was following in his memorable journey across the continent. Mr. Lindsay remained in the Territory until May, 1882, and during that time rendered invaluable service to the cause of exploration. He advised the route of the Northern Territory railway from Palmerston to Pine Creek, altogether distinct from that surveyed in 1878, and which, although slightly longer, it was said, would reach the agricultural land and the vicinity of the known gold and tin discoveries. Resigning his connection with the Government service in 1882 Mr. Lindsay came to Adelaide and undertook private business, but in 1883 he was commissioned by the Government to explore Arnheim's Land. The expedition, comprising six men all told, including a couple of blacks, took five months to complete the

work. Their travels represented the traversing of nearly 2,000 miles of unexplored country, and were associated with most exciting incidents. The expedition led on by Mr. Lindsay with much intrepidity and skill was very successful, and the information given as the outcome of the trip resulted in the country being sold and stocked. Mr. W. Cuthbertson, of New Guinea fame, was second in command. Among important discoveries made by the explorers was that of the Gwendoline Falls, upwards of 195 ft. in height, on the Baker Range, some sixty miles from Southport. During 1884 and 1885 Mr. Lindsay was engaged in surveying on behalf of the Water Conservation Department in the Murray district and on the West Coast. In November, 1885, he started on an expedition, undertaken on his own account, to explore the country between the Dalhousie Springs and the Herbert. It was on this trip that he discovered "the ruby-fields" in the MacDonnell Ranges, and reported upon auriferous deposits there. At the Herbert River Mr. Lindsay, who was accompanied by a party of seven, commenced the survey of 550 miles of run boundaries and connecting with the Overland Telegraph line north of Powell's Creek. Thence he went down the Macarthur River to the new port of Borroloola. On this expedition eight camels were lost. This was his latest journey of exploration."

Leichardt, who left Sydney to cross Australia, in 1848, has not been heard of, and it is hoped that the present expedition may clear up the mystery of his fate. This object is to be kept in view, and the Geographical Society defines it:

"The leader is instructed to return with his party by a southeasterly route through the unmapped country to the eastward of the Transcontinental Telegraph Line in the Northern Territory [of South Australia] and Queensland; and one special object of this will be to follow up any trace of Leichardt if the search to the westward has proved fruitless. The hope of finding some traces of this lost party must not be given up so long as the remotest chance exists of making any discovery; and as there is good reason to believe that the route of the party has been reliably traced to a point in Queensland about lat. 23° 30′ S. long. 144° E., a zealous search may yet reveal some further information. The leader's special attention is called to this obligation as one of the objects of the expedition; and not only the leader, but all the members of the party, must be ever on the alert to seize upon the minutest facts which may be likely to throw some light upon this deeply interesting mystery."

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THE ROYAL SOCIETY OF NEW SOUTH WALES offers its Medal and Money Prize for the best communication (provided it be of sufficient merit) containing the results of original research or observation upon each of the following subjects :

SERIES XI.—*To be sent in not later than 1st May, 1892.*

No. 37.—On the Iron Ore Deposits of New South Wales. The Society's Medal and £25.

38.—On the Effect which Settlement in Australia has produced upon Indigenous Vegetation ; especially the depasturing of sheep and cattle. The Society's Medal and £25.

39.—On the Coals and Coal Measures of Australasia. The Society's Medal and £25.

SERIES XII.—*To be sent in not later than 1st May, 1893.*

No. 40.—Upon the Weapons, Utensils, and Manufactures of the Aborigines of Australia and Tasmania. The Society's Medal and £25.

41.—On the Effect of the Australian Climate upon the Physical Development of the Australian-born Population. The Society's Medal and £25.

42.—On the Injuries occasioned by Insect Pests upon Introduced Trees. The Society's Medal and £25.

The competition is in no way confined to Members of the Society, nor to residents in Australia, but is open to all without any restriction whatever, excepting that a Prize will not be awarded to a Member of the Council for the time being ; neither will an award be made for a mere compilation, however meritorious in its way. The communication to be successful must be either wholly or in part the result of original observation or research on the part of the Contributor.

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The Society is fully sensible that the money value of the Prize will not repay an investigator for the expenditure of his time and labor, but it is hoped that the honor will be regarded as a sufficient inducement and reward.

The successful Papers will be published in the Society's Annual Volume. Fifty reprint copies will be furnished to the Author free of expense.

Competitors are requested to write upon foolscap paper—on one side only. A motto must be used instead of the writer's name, and each Paper must be accompanied by a sealed envelope bearing the motto outside, and containing the writer's name and address inside.

All communications to be addressed to the Honorary Secretaries.

F. B. KYNGDON, } Hon. Secs.
W. H. WARREN, }

The Society's House,
5 Elizabeth Street,
Sydney, 26th November, 1890.

TITLES OF SUBJECTS IN GEOGRAPHICAL JOURNALS.

BERLIN—*Verhandlungen der Gesellschaft für Erdkunde.*

The Ninth German Geographical Congress, at Vienna, by G. Kollm—A Voyage to the Bonin and Volcano Islands, by Dr. O. Warburg—*Fead*, or *Faed* Islands?—The Investigation of the Uppermost Strata of the Atmosphere, by Prof. Dr. W. Förster—Prof. Dr. A. Bastian on his latest Journey in Central Asia.

Zeitschrift.

The Most Southern Part of Brazil (Rio Grande do Sul), by Dr. A. Heltner—The transverse Con-

ical Projection, true to the surface, for the Map of Africa, by Dr. A. Bludau—From Peter Martyr's Letters: Notes from the History of the great Discoveries, by Eugen Gelcich.

EDINBURGH.—*The Scottish Geographical Magazine.*

British Civilization and Influence in Asia. By Arminius Vambéry—The Lake Region of Central Africa: A Contribution to the History of African Cartography. By E. G. Ravenstein—Definitions of Geographical Names. By Konrad Ganzenmüller, Ph. D.—Britannic Confederation: II. The Physical and Political Basis of National Unity. By Edward A. Freeman—Mapping and Place-Names of India. By James Burgess, LL.D., C. I. E., etc.—The Orthography of African Names and the Principles of Nomenclature. By W. A. Elmslie, M. B., C. M., Livingstonia Mission—Britannic Confederation: III. The Commerce of the British Empire. (*With Diagrams.*) By Geo. G. Chisholm, M. A., B. Sc.—How Maps are Made. By W. B. Blaikie. (*Illustrated.*)—Rewa River, Fiji. By H. H. Thiele. (*With a Map.*)—Britannic Confederation: IV. Tariffs and International Commerce. By Professor Shield Nicholson—The Geography of South-West Africa. By Dr. Henry Schlichter—Census of the United Kingdom, 1891.

GOTHA.—*Petermanns Mitteilungen.*

The Occupation of the Low Land between the Mouths of the Elbe and the Eider. By Dr. R. Hansen—The Valley of the Rio Grande, in

Mindanao. By Prof. Dr. F. Blumentritt—The Distribution and Expansion of the Races in Brazil according to our present Knowledge. By Dr. P. Ehrenreich—A Depression in the Centre of the Asiatic Continent. By Gen. A. von Tillo—The Sargasso Sea in the North Atlantic. By Prof. Dr. O. Krümmel—The North Polar Limit of the Inhabited and Habitable Earth. By Dr. Kurt Hassert—The Island of Zante. By Prof. Dr. J. Partsch—Results of K. von Ditmars' Explorations in Kamtschatka in the years 1851–55. By Dr. C. Diener—From the Victoria Nyanza by way of Tabora to Bagamoyo. By Dr. Wilhelm Junker—The Dividing Line of the Arctic Winds, and Recent Polar Projects. By Prof. Dr. A. Supan.

LIMA.—*Boletín de la Sociedad Geográfica.*

Introduction—Decrees for Foundation and Organization—District in the Province of Bongará—Meteorological Phenomenon in Ayacucho—Antonio Raimondi and His Work—Lecture on the River Purus—Phenomenon Called *El Pintor* (by Raimondi)—The Winds (Raimondi)—High Tableland of the Beni—The Amazonian Provinces of Peru as a Field for English Enterprise—Report on the District of Acobamba—Archæological Monument at Tarma—Restoration of the Campo de Chupas—Report of the Commission on the Collections left by Raimondi—Geology of Huanta.

LONDON. — *Proceedings of the Royal Geographical Society.*

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The Annual Address on the Progress of Geography, 1890–91. By the Right Hon. Sir Mountstuart E. Grant Duff, G.C.S.I., President — The Indian Surveys, 1889–90 — Our Present Knowledge of the Himalayas. By Colonel H. C. B. Tanner (Indian Staff Corps) —Mr. Alfred Sharpe's Journey from Karonga (Nyassa) to Katanga (Msidi's Country) viâ the Northern Shore of Lake Mwero— Geographical Education : The Year's Progress at Oxford and Cambridge—Exploration of the Benue and its Northern Tributary, the Kebbi. By Major Claude M. Macdonald (H.M. Commissioner to the Oil Rivers)—The Volcanic Lake of Tritriva, Central Madagascar. By the Rev. James Sibree, Jun.—Ptolemy's Topography of Eastern Equatorial Africa. By Henry Schlichter—The Selkirk Range, North-West America. By Harold W. Topham.

MADRID.—*Boletín de la Sociedad Geográfica.*

Las Jurdes and Its Legends. By D. Vicente Barrantes—The Climate of Spain. By D. Antonio Blázquez—Report on the Condition of the Geographical Society. By D. R. Beltrán y Róspide—Review of Geographical Progress. By D. Martín Ferreiro.

MEXICO.—*Boletín de la Sociedad de Geografía y Estadística.*

Commemorative Session in honor of the Licentiate and Engineer Don Manuel Orozco y Berra—Origin of the Plural Terminations in the Nahuatl and in some other allied Tongues.

By Sr. V. Reyes—The Goddess of the Water and of the Moon. By Sr. V. Emilio Riedel—Notes on European Meteorological Observatories and Institutes, visited by Rafael Aguilar Santillán.

PARIS.—*Compte Rendu de la Société de Géographie.*

Dutreuil de Rhins in Central Asia—Causes of Chinese Emigration (de Groot)—Letter from M. Ponel on Crampel's Expedition—Travels of M. Quiquerez in Upper Guinea—M. Foa in South Africa—Dr. Ten Kate in the East Indian Archipelago—Notes of Count Meyners d'Estrey on the East Indies, on the Key Islands and on Time-Reckoning in the Philippines—Dr. Rae's Arctic Explorations—Prince R. Bonaparte's Notes on the Swiss Cantons (Unterwalden and Glaris) and on Corsica—M. Sabatier's work on *Touat, Sahara et Soudan*—Cheysson and Toqué on the "*Comparative View of Earnings and Expenses of One Hundred Workingmen's Families.*"—Garnier's Travels in America and in Canada—Gailly's *Manitoba* and the Canadian North-west—Proceedings at the Reception of M. Henri Coudreau and his Account of Travels in Guiana—Foundation of the Prize *Barbié du Bocage* (Gold Medal to be given every three years for the best work written in that time on French Geography, or written in French on a Geographical subject)—Another Foundation of a Gold Medal, the Prize *Louise Bourbonnaud*, to be given every year, to an explorer, French

by nationality—Another Foundation, the Prize *Herbet-Fournet*, of a Gold Medal and a sum of 6,000 francs, to be given every two years to the author of the voyage (or travel) judged to be most important and most useful for the progress of geographical science; or, failing this, to the French explorer, whose travels are held to be most useful for the development of the French influence and international relations, or for the extension of the colonial territory; or, failing this, to the best travels performed for commercial studies and aims; or, finally, to the author of the best and most important work on geographical science. [The three Foundations described are due to the generosity of three ladies, the Marquise de Preaulx, Mme. Louise Bourbonnaud, and Mme. Herbet]—Congress of French Geographical Societies—International Geological Congress—M. Rolland on the Transsaharan Railway—M. Forest on Emigration from Morocco to the French Sudan—The Universal Hour—Vasseur and Carez, Geological Map of France—Tomb of Victor Jacquemont—M. Martel on the Subterranean Caverns of Austria and France—M. Venukoff's Russian Notes—Moser's Collections in Central Asia—M. Drapeyron on the *Geographical Course on Classical Instruction*—M. Meyners d'Estrey on Borneo—Schefer and Cordier's Travels of *Frère Odoric de Pordenone*—M. Paul Pelet's Atlas of the French Colonies—Leon Leleux's Photograph of Val-

sequa's Map (1439)—M. Alex. Boutroue on Portugal.

Bulletin.

Foureau's Expedition to the Tademayt—Jaime on the Niger, its Currents and Freshets—Rabot's Explorations in Russian Lapland—Tourane and the Centre of Annam (Gouin)—Coudreau's Notes on 53 Tribes of Guiana—French Geodesy (Lieut. Col. Bassot)—From the Ogowe to the Campo (Fourneau)—Lieut. Col. Humbert's French Sudan (with a map)—Gouin on the Annamite Costumes—Notes on a Map of America (1669), by Gabriel Marcel.

ROME.—*Bollettino della Società Geografica Italiana.*

Elio Modigliani among the Independent Bataks—Letter of Capt. E. Baudi di Vesme from the Peninsula of the Somali—From Asuncion to La Paz by Prof. L. Balzan—From Maj. Gaetano Casati's Book—The Emancipation of Colonies, by Prof. Dr. G. Coen—Tschungking, the New Chinese Port Opened to Europeans—From Berbera to Ime and the Harar, by E. Baudi di Vesme—From Toba Lake (Sumatra) to Pulo Bandar, by E. Modigliani.

SAN FRANCISCO—*Transactions and Proceedings of the Geographical Society of the Pacific, Vol. II, No. 1.*

Humboldt Bay, by Prof. George Davidson, A. M., Sc. D.—Geographical and Ethnographical Notes on Alaska, by Ivan Petroff—Corea, the Hermit Kingdom, by John T. Scott.

VIENNA.—*Mittheilungen der Kais. Königl. Geographischen Gesellschaft.*

On the Settlement of the Bukowina, by R. F. Kaindl—Remarks to accompany the Map of eastern Mindanao, by Prof. F. Blumentritt.

FINAL NOTE, *September 20.*

The American Geographical Society acknowledges the courtesy of the Minnesota State Historical Society and Mr. J. V. Brower, Commissioner of the Itasca State Park, in furnishing for the present BULLETIN the *Detailed Hydrographic Chart of the Ultimate Source of the Mississippi River.*

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WASHINGTON LETTER.

WASHINGTON, SEPTEMBER 10, 1891.

Washington has had an epidemic of conventions. There is an impression abroad that this locality is a very proper one to leave alone in summer time. With the exception of two days, no more delightful temperature could be found in the United States than prevailed here during the month of August. Here is a list of the organizations that thoroughly enjoyed during that month the many attractions of the capital of the Nation :

The American Microscopical Society.

The Association of American Agricultural College and Experiment Stations.

The Association of Official Agricultural Chemists.

The Society for the Promotion of Agricultural Science.

The Conference of American Chemists.

The Association of Economic Entomologists.

The American Association for the Advancement of Science.

The Geological Society of America.

The Fifth International Congress of Geologists.

The Catholic Total Abstinence Union of America.

The Association of Amateur Oarsmen—Regatta.

The Old Time and Military Telegraphers.

During the month of September there will be reunions of the Congress of American Physicians and Surgeons, the American Pomological Society, delegates

of Catholic Temperance Societies, the Supreme Council of Chosen Friends, and the Superintendents of the Railway Mail Service. And in October the Methodist Ecumenical Council.

The most numerously attended of these was the meeting of the American Association for the Advancement of Science. Six hundred and fifty-three members were present; three hundred and seventy-one new ones were elected. Two hundred and forty-five papers were announced in the eight sections, the largest number being in the section of Biology. There was a large amount of very eager interest, amounting in some cases to positive enthusiasm.

It will be quite impossible to do more than designate by letter some of the most notable productions:

SECTION A.—MATHEMATICS AND ASTRONOMY. 20 Papers.

Principles of the algebra of physics, by A. Macfarlane.

The secular variation of terrestrial latitude, by G. C. Comstock.

Latitude of Sayre Observatory, by C. L. Doolittle.

Exhibition and description of a new scientific instrument, the aurora-inclinometer, by Frank H. Bigelow.

SECTION B.—PHYSICS. 23 Papers.

A new method of measuring the expansion of solids, by E. W. Morley.

Do tornadoes whirl? By H. A. Hazen.

SECTION C.—CHEMISTRY. 37 Papers.

Synthesis of weighed quantities of water from weighed

quantities of oxygen and hydrogen, by Edward W. Morley.

The influence of negative atoms and groups of atoms on organic compounds, by Paul C. Freer.

SECTION D.—MECHANICAL SCIENCE. 15 Papers.

On a method of holding samples of wood and brick for determination of tensile strength, by James E. Denton.

SECTION E.—GEOLOGY AND GEOGRAPHY. 30 Papers.

Preliminary report of observations on the deep well near Wheeling, West Va., by William Hallock.

The altitude of the eastern and central portions of the United States during the glacial period, by T. C. Chamberlin.

Neocene and pleistocene continent movements, by W J McGee.

The plant-bearing deposits of the American trias, by Lester F. Ward.

The relations of the Archean and Algonkian in the north west, by C. R. Van Hise.

New meteoric iron from Arizona, containing diamonds, by A. E. Foote.

SECTION F.—BIOLOGY. 64 Papers.

Uses of the fermentation tube in bacteriology, with demonstrations, by Theobald Smith.

Micro-organisms as insecticides, by C. V. Riley.

The present condition of the study of deep-sea fishes, by G. Brown Goode.

Another chapter in the history of the Venus fly trap by J. M. McFarlane.

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On the importance of a table at the Naples station, by Charles W. Stiles.

The persistence and relation of faunal realms, by Theodore Gill.

SECTION H.—ANTHROPOLOGY. 30 Papers.

A linguistic map of North America, by J. W. Powell.

An experiment in human stirpiculture, by Anita Newcomb McGee.

Evidences of the high antiquity of man in America, by Thomas Wilson.

On the distribution of stone implements in the tide-water provinces, by W. H. Holmes.

Outlines of Zuñi creation and migration myths considered in their relation to the Ka-ka and other dramas or so-called dances, by Frank H. Cushing.

SECTION I.—ECONOMIC SCIENCE AND STATISTICS. 26 Papers.

The census counting machine, by J. S. Billings.

The southern oil fields, by W J McGee.

The artesian wells and underground waters of central Texas, by Robert T. Hill.

Free coinage; Why not? By Edward Atkinson.

The coinage ratio in our silver policy, by Edward T. Peters.

The local committee presented in an attractive form the "Programme"—192 pp., and a "Guide to Washington and its scientific institutions," accompanied by a 20-foot contour map of the district and adjacent portions of Maryland and Virginia.

The Guide is a concise and very admirable exposition

of the District, City, Departments, Scientific Institutions and Libraries.

At the final meeting of the association Mr. G. Brown Goode gave an account of the history of this organization; stating that it had two parents,—the National Institution for the Promotion of Science, and the American Association of Geologists. When in 1848 the American Association for the Promotion of Science was founded in Philadelphia, one of the parent bodies contributed the first half of the name, viz., "The American Association," while the Washington society contributed the remainder—"For the Promotion of Science."

The National Institution above referred to, was very powerful for a time. In 1844 it had 1,600 names upon its rolls, and in that year organized in Washington the first national congress of scientific men ever held in America. President Tyler, John Quincy Adams and John C. Spencer presided at the meetings, and nearly fifty papers of great value were read.

The Secretary of the Association announced that the Government of Honduras had granted the Museum at Cambridge, Mass., the exclusive right to explore the scientific resources of that country for a period of ten years.

The excursions of the Association at this session included visits to Harper's Ferry, Old Point Comfort, Norfolk, Virginia Beach, Luray Cave, Atlantic City, and Mount Vernon.

The Geological Society of America held five sessions on the 24th and 25th of August. This society has a membership of 200, comprising the leading geologists of

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the country. Several eminent scientists from Germany, England, Russia, Belgium, Sweden and Roumania read papers and participated in the discussions at this meeting, as did also C. D. Wolcott, Lester A. Ward, R. A. F. Penrose, Jr., Bailey Willis, Thomas C. Chamberlin, Warren Upham, E. W. Hilgard and others.

The International Congress of Geologists,—one of the most celebrated scientific organizations in the world —began its fifth meeting on the 26th of August. Sessions were continued during six days. The Congress meets about once in every three years. The first meeting was held in Paris; the subsequent ones in Bologna, Berlin and London. The meeting just closed is the first one held in this country. Large numbers of the scientists who attended meetings of organizations, preceding this, remained over for the purpose of seeing men whose names are known the world over for their splendid researches and investigations. The honorary Presidents are two eminent Americans—James Hall and J. D. Dana. The President is also an American —the venerable J. S. Newberry.

There were present three members from Austria-Hungary, three from Canada, one from Chile, four from France, twenty-one from Germany, ten from Great Britain, three from Mexico, one from Peru, three from Roumania, seven from Russia, four from Sweden, two from Switzerland, and one hundred and fifty-seven from the United States; also delegates from seven foreign Governments, and nineteen foreign and American scientific organizations.

In the place of papers or essays prepared and read or submitted by their respective writers, the plan of the

International Congress contemplates the discussion of live geologic topics provisionally determined upon in advance, subject to the approval of the Council. The Council consists of the Founders' committee, 10 members; the Committee of organization, 34 members; and the Bureau, 64 members;—also the Presidents of Geological Societies and Directors of great Geological Surveys who may be attending the meeting. As at present constituted the Founders' Committee is mixed —American and foreign; the Committee of Organization entirely American; the Bureau, almost entirely foreign.

The business outlined consisted of: (1) Report of committee on classification and nomenclature, and discussion of same. (2) Report of committee on map of Europe, and discussion of same. (3) Discussion of classification of Pleistocene rocks. (4) Discussion of correlation. (5) Discussion of map notation.

No reports were submitted under the first two divisions, so that the attention of the Congress was in the main confined to the last three, viz.: the classification of Pleistocene rocks; correlation of geological formations,* and map-coloring and cartography.

A feature of this Congress was the trip of 6,000 miles to the most interesting geologic points, to terminate in New York, September 26th. The route arranged traverses thirty-nine degrees of longitude, and crosses twenty States and Territories and a Province of Canada. In each region of special geological interest the party will be guided by geologists† familiar with

* The U. S. Geological Survey has in press a number of essays on this subject.

† Arnold Hague; J. P. Iddings; S. F. Emmons; G. K. Gilbert; Whitman Cross; J. W. Powell; N. H. Winchell.

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the ground. A large number availed themselves of this opportunity, using a special train of vestibuled cars which will be the home of the party during the principal portion of the journey.

No one present received such marked attention as the distinguished Paleontologist of New York. Professor James Hall, an incessant worker all his life, finds himself at eighty-one in the possession of the vigor and strength that few men have at forty. He is the Nestor of American geologists, and one of the founders of the International Congress. He attended the meeting in Paris in 1878, in Bologna in 1881, and in Berlin in 1885. At the session just ended the members gave him a special greeting in writing, subscribed by columns of names that would excite the envy of all the autograph collectors in Christendom. Prof. James Macfarlane once said: "The State of New York is to the geologist what the Holy Land is to the Christian, and the works of her Paleontologist are the old Testament Scripture of science."

RESULTS OF THE CENSUS.—There are some important developments in what (for the present) are termed minor mineral industries. The importation of Trinidad asphaltum into the United States increased in the decade between 1880 and 1890, from 3,913 to 54,692 tons.* This material, as is well known is chiefly used for street pavements, and its application to any great extent in this country seems to date from the year 1882. Prior to that date there had been laid 223,467 square yards; but in 1890 there was an aggregate of 6,803,054 square yards, equivalent to 446 miles of roadway 26

* Census bulletin, 1890, no. 75, by E. W. Parker.

feet wide. It would seem that climatic efforts had little consideration in the application of the material to this purpose, as the range of cities where it is used extends from New Orleans to Quebec,—the largest proportion being in the north, if the city of Washington with its one hundred miles is included in this division. The State of New York claims the largest number of localities. About fifty-five thousand square yards of bituminous limestone pavement were laid in Washington and in New York City prior to 1884, but nearly all of this was subsequently taken up and replaced by Trinidad asphaltum. Captain F. V. Greene, of New York City, estimates that the total amount of bituminous limestone pavement now in use in the United States does not exceed seventy-five thousand square yards. The asphalt pavements in Europe are all made from this limestone. The total area covered is about one-fourth of that covered by Trinidad asphalt pavements in the United States, and exists in Berlin, London, Paris, and a few other cities, probably not exceeding ten in all.

The production of asphaltum in the United States to any appreciable extent dates as recently as the year 1888, when there was the very marked average of 50,000 tons over 4,000 in 1887, due to the discovery in California of bituminous rock (a sandstone formation impregnated with asphaltum), which came into the market as a competitor with other kinds of material for street paving. Until this remarkable formation in California, the island of Trinidad, France and Switzerland furnished the bulk of the world's supply.

The bituminous rock is more easily and cheaply prepared for street-paving purposes than any of the

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asphaltum products. In the case of the rock of Ventura and Santa Barbara counties, California, it is only necessary to mix it when heated with the sand of the locality where it is used, in the proportion of from three to eight times by bulk of sand to one of asphaltum. It requires only an hour after laying to "set" and be ready for traffic. Once properly mixed and laid, it seems practically indestructible. The bituminous rock of San Luis Obispo and Santa Cruz counties is thoroughly impregnated with bitumen. The only treatment necessary is to steam it, so as to thoroughly mix its ingredients and soften it for spreading to a uniform thickness and a smooth, even surface. It is reported that pavements made of this material fifteen years ago and used under heavy travel have recently been removed and found to have lost very little either in weight or thickness; also, that it stands equally well the high temperatures of the interior cities and the cold, damp atmosphere of the coast.

Notwithstanding these great advantages of the California bituminous works, Trinidad asphaltum is used for street paving in eastern cities to the almost entire exclusion of other kinds. The railroad freight rates from the Pacific coast practically shut out the bituminous rock from competition in the eastern cities. A similar condition inversely stated, may be said to affect the sale of Trinidad asphaltum in Europe, since the bituminous limestones of France and Switzerland, having the advantage in freights, control the markets. It is not unlikely that asphaltum deposits will be found in other portions of the United States.

The value of buhrstones and millstones produced in

the United States has decreased from $150,000 in 1883 to $35,155 in 1889, and the importations from $125,072 in 1881 to $40,884 in 1889. This is due largely to the introduction of the roller process for grinding cereals. Proprietors of flouring mills not using the roller process prefer stones made from French buhr, a quality not yet found in the United States. The American product is found in the Allegheny range in New York, Pennsylvania, Virginia and North Carolina.

In the same region, and extending southward through South Carolina and Georgia, is found the American product of asbestos, which has shown an annual decrease since 1882. The product of that year was 1,200 tons; in 1889 it was 30 tons. But the imports of this article have increased from a valuation of $9,736 in 1880 to $263,393 in 1889. While the American article is said to stand a greater degree of heat than the foreign material, the fibre is more brittle and harsh, and not so well adapted to the manufacture of spun or woven goods.

The pyrites treated in the Census investigations includes only that mined for its sulphuric contents and used in the manufacture of sulphuric acid. It occurs more or less plentifully in almost every State of the Union, but its production during 1889 was limited to three States, New Hampshire, Massachusetts and Virginia, the largest being in Virginia. Considering the liberal distribution of pyrites and the economy with which sulphuric acid may be prepared from it, the production is as yet comparatively small. But more attention is now being paid to it, particularly in the Southern States. The increase of the product has been very

marked, viz., 12,000 long tons in 1882 and 104,950 short tons in 1889.

Mr. R. L. Packard* says that aluminium has been attracting an amount of attention during the last two or three years which is out of proportion to its actual importance as a metal and the position in the arts which it has hitherto occupied. This is accounted for by the comparatively recent appearance of the metal in commerce, the difficulty of extracting it, and the unfamiliar and elaborate metallurgical processes which have been invented in consequence. Mr. Packard reviews briefly the history of these methods of extraction, from the date of Sir Humphry Davy's experiments in 1807 to the electro-metallurgical processes of the last decade. The pioneer of this last industry is the Cowles Electric Smelting and Aluminum Company at Lockport, N. Y., established in 1885. The total production of aluminium in the United States during 1889, including that contained in alloys was 47,468 pounds, with a value of $97,335.

Until the recent metallurgical use of aluminium in treating molten iron was introduced, the metal was worked in this country in a small way, principally for parts of optical, engineering, and astronomical instruments, balance beams, light weights, and the like where lightness and strength are desired. It had never been seen in any quantity until the Paris Exposition of 1855, where it was shown in ingots and in the form of manufactured articles. The price was then about $200 per pound. It was still somewhat of a curiosity at the Exposition of 1878, when it was exhibited in blocks, wire,

* Census Bulletin, 1890, no. 79.

sheets, and foil, and in various objects, from a thimble and penholder to dinner sets of aluminium bronze and metal. Telescopes, opera glasses, and other optical instruments, mounted wholly or in parts in aluminium, and chemical balances made of the same metal, were shown which were very light and strong. But the production from all sources—French, English and American—exclusive of alloys, from 1860 to 1889, did not exceed 116 tons—an inconsiderable quantity of metal. The indications are that the manufacture will be so largely increased from now on that this amount will soon be exceeded by the annual production.

The principal sources of aluminium have hitherto been cryolite from Greenland, and imported bauxite. The Greenland mine is near Arksut. In recent years, the Pennsylvania Salt Manufacturing Company has imported several thousand tons annually. A writer in the New York *Sun* describes the present appearance of the mine or quarry as "a hole in the ground, elliptical in shape, and say, 450 feet long by 150 wide." The pit is 100 feet deep, and drills have penetrated 140 feet deeper and found cryolite all the way.

The increased demand for alumina-bearing materials has called attention to American deposits of bauxite. It has been found in several places in Floyd County, Georgia, and recently in Saline and Pulaski counties, Arkansas.

Since the year 1880 the United States has become the largest copper producer in the world, outstripping by far any other country. Out of a total of 226,055,962 pounds produced in 1889, 217,264,304

pounds were from Montana, Michigan and Arizona. Arizona, after Michigan, became a great copper-producing region, and later Montana outstripped both, and now maintains its rank as the leader. The capital invested in the United States is $62,623,228; and the expenditure in 1889 was $12,062,180.

There has been a remarkable increase since 1880 in coal production in West Virginia, Kentucky, Tennessee and Virginia, viz., from 3,469,336 to 11,649,266 tons,—the highest rates of increase being in Virginia and Tennessee. No State in the Union* is more favored in the extent and diversity of its mineral deposits than West Virginia. Her coal embraces all grades of bituminous, steam, cooking, and gas coals of the highest qualities. The natural water-ways, improved slack-water navigation, and increasing railroad facilities are important factors in the development of the resources of the State, which must soon be accorded a leading position in wealth and industrial prosperity.

According to the Census returns of 1890, the limestone industry is ahead of all other stone interests. Of the various uses made of the stone the production of lime is the chief, followed by that used for building purposes, next for flux in furnaces, and finally for bridge, dam, and railroad work. For building purposes the stone produced in Illinois and Indiana far outranks the other States; while for lime, the products of Pennsylvania and Maine are exceptionally large. Of the total output more than one-half was produced in the North Central States. Geographically described the division was as follows:

* Mr. John H. Jones, in Census Bulletin 1890, no. 94.

North Atlantic - - -	$6,491,834
South Atlantic - - -	464,171
North Central - - -	10,185,203
South Central - - -	937,351
Western - - - -	1,016,620
	$19,095,179

Costly and rash experiments in the use of limestone for outside building have brought about the exercise of discrimination in the selection or adaptation of this material for such purposes. But statistics are not given that throw any light on its relative use or disuse during the last ten, fifteen or twenty years.

In accordance with the present plan the final publications of the Eleventh Census (1890) will consist of the following volumes:

The Digest.

The Compendium:

Part 1—Population and social statistics.

Part 2—Wealth and industries.

Volume I.—Population—Robert P. Porter, Henry Gannett and William C. Hunt:

Part 1—Characteristics, conditions, distribution and parentage.

Part 2—Occupations.

Volume II.—Vital and social statistics—John S. Billings, surgeon, United States army:

Part 1—Mortality and vital statistics.

Part 2—Social statistics.

Part 3—Statistics of special classes.

Part 4—Frederick H. Wines—Crime, pauperism and benevolence.

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Volume III.—Educational and church statistics:

Part 1—James H. Blodgett—Statistics of education and illiteracy.

Part 2—Henry K. Carroll—The religious bodies of the United States: Statistics showing the number of organizations, edifices and communicants; with historical and descriptive statements.

Volume IV.—Valuation, taxation and public indebtedness—J. Kendrick Upton and T. Campbell Copeland:

Part 1—Valuation and taxation.

Part 2—Receipts and expenditures.

Part 3—Indebtedness.

Volume V.—Farms, homes and mortgages—John S. Lord and George K. Holmes:

Part 1—Recorded Indebtedness.

Part 2—Ownership of farms and homes and indebtedness thereon.

Volume VI.—Agriculture:

Part 1—John Hyde—Statistics of farms: Irrigation, Frederick H. Newell; tobacco, Thomas N. Conrad; cereals, grass lands and forage crops, the fibres, forestry, sugar, live stock on farms, dairy products, wool, miscellaneous.

Part 2—Mortimer Whitehead—Horticulture, including truck farming, floriculture, seed farming, nurseries, tropic and semi tropic fruits, J. H. Hale; viticulture, live stock on ranges, live stock not on farms.

Volume VII.—Manufactures—Robert P. Porter and Frank R. Williams:

Part 1—General statistics of manufactures, statistics of specified industries, manufactures of cities.

Part 2—Reports of expert special agents, as follows:

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Lumber-mills and saw mills and timber products, George A. Priest; slaughtering and meat packing, Thomas C. MacMillan; chemical manufactures and salt, Henry Bower; clay and pottery products, Henry T. Cook; coke and glass, Joseph D. Weeks; cotton manufactures, Edward Stanwood; dyeing and finishing of textiles, P. T. Wood; electrical industry, Allen R. Foote; manufactured gas, George W. Graeff; iron and steel, Wm. M. Sweet; printing, publishing and periodical press, wool manufacturers, S. N. North; ship building, Charles E. Taft; silk and silk goods, Byron Rose.

Part 3—Statistics of special industries: Agricultural implements, paper-mills, boots and shoes, leather, brick yards, flour and grist mills, cheese, butter and condensed milk factories, carriages and wagons; leather.

Volume VIII.—The mineral industries of the United States—David T. Day; iron ore, John Birkinbine; gold and silver, Richard P. Rothwell; copper, lead and zinc, Charles Kirchoff; quicksilver, James B. Randol; manganese, petroleum, natural gas, Joseph D. Weeks; aluminium, R. L. Packard; coal, John H. Jones; stone, William C. Day; precious stones, George F. Kunz; mica, Lyman J. Childs; mineral waters, Dr. A. C. Peale; minor minerals, E. W. Parker.

Volume IX.—Fish and Fisheries—Charles F. Pidgin and Bert Fesler:

Part 1—Statistics of fisheries by geographical divisions.

Part 2—Statistics of fisheries by name.

Part 3—Appendix, containing scientific and proper names of fishes, with their geographical distribution; illustrations of the principal food fishes of the United

States; condensed description of fish by species; statistical summary for each species for the United States.

Volume X.—Transportation—Henry C. Adams.

Part 1—Railroads: Statistics for the year ending June 30, 1890; statistics for ten years ending in 1889.

Part 2—Lake, ocean, river and canal transportation; Canals, T. C. Purdy; transportation on the Pacific coast, T. J. Vivian.

Part 3—Express business.

Part 4—Street railways, Charles H. Cooley.

Volume XI.—Insurance, Charles A. Jenney.

Volume XII.—Report and statistics of the condition of Indians living within the jurisdiction of the United States, 1890, taxed and untaxed, Thomas Donaldson.

Volume XIII.—Alaska, Ivan Petroff.

Veterans of the Civil War. (Seven volumes of 1000 pages each; publication not yet authorized.)

Statistical Atlas. (Publication not yet authorized.)

It is expected that the Compendium will be out of press by the time of the meeting of Congress in November. With the exception of eight or ten special agents gathering the fragments of information in relation to manufactures the field work of the Census is completed. Work has been commenced on the text of the final population volume and some of the maps are in course of preparation.

Aside from the Bulletins giving the population by minor civil divisions for each State, the following bulletins have been issued by the population division:

Bulletin No. 16—Population of the United States by States and Territories: 1890. The correct account, 62,622,250.

Bulletin No. 37—Population by counties: North Atlantic and South Atlantic divisions.

Bulletin No. 40—Population by counties: North central division.

Bulletin No. 42—Population by counties: South central and western divisions.

Bulletin No. 48—The white and colored population of the South: 1890.

Bulletin No. 52—Urban population in 1890, of cities containing 8,000 inhabitants or more.

In the veteran section 256,498 cards have been transcribed to date.

GEOGRAPHIC NAMES. When the United States Hydrographic Office requested the co-operation of maritime nations in establishing rules for the systematic spelling of geographic names all over the world, several inquiries were propounded. This was one of them: "Standard geographical dictionary, or authorities on geographical names (national, local and universal)?" The replies are valuable and interesting.

Great Britain. "We consider no geographical dictionary as a standard, and hunt up different authorities which we consider most worthy of credence for every separate district. Hunter's Dictionary has been adopted as the guide for Hindustan."—*W. J. L. Wharton, Captain R. N., Hydrographer.*

Spain. "The geographical dictionary by Don Pascual Madoz, published in 1845–50, is of a national character; also a dictionary of the corporations of Spain (cities and towns) by Señor Mariana. Of a general character there is the geographical dictionary by Riera, 1880–85; the Spanish-American Encyclopedia (being

published); the Universal Geography, published in 1830 by a literary society. Of a chorographical character, the geographical dictionary of Navarra and of the provinces of Álava, Guipúzcoa and Biscay, published by the Royal Historical Society (Academy) in 1802; that of the island of Cuba, by Don Jacobo de la Pezuela, 1863; and that of the Philippine Islands, by Buceta and Bravo, 1850. The Royal Historical Society (Academy) published many years ago a vocabulary of geographic generic names, and recently has published another more complete, with the corresponding French names, by Don Juan Vilanova y Piera."—*Pelayo Alcalá Galiano.*

Chile. El Diccionario jeográfico de Chile, por F. S. Astaburuaga, New York, 1867. Un informe pasado a la Universidad, por Don B. Vicuña Mackenna, in the Annals of the University of 1863."—*Fco. Vidal Gormaz.*

Netherlands. "The kingdom of the Netherlands possesses no standard works concerning the spelling of geographical names of its country and its colonies; also, it has in that science no recognized authorities. The dictionary of geographical names in the Netherlands published by the Dutch Geographical Society (Woord enlijst van de Aardrijkskundige namen in Nederland van het Nederlandsch Aardrijkskundig Genootschap, 2d druk, Amsterdam, C. L. Brinkman) may, however, be regarded as a standard because a great many authors of geographical school books of the Netherlands, and chart and atlas makers follow it. As concerning the Dutch colonies in the East and West Indies there exists no dictionary that can be considered as authoritative."—*De D. V. Broecke, Captain, Hydrographer.*

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Denmark. "Our authority on Danish names as used in charts and sailing directions is Statistisk-topografisk Beskrivelse of Kongeriget Denmark, ved I. P. Trap Kjóbenhavn 1879. On Icelandic names, Uppdráttr Islands á fjórum blödum (chart of Iceland in four sheets) published by the Literary Society of Iceland. On Greenlandic names, Den Grönlandske Ordbog af Sam. Kleinschmidt, 1871, published by the Church and School Department in Copenhagen."—*G. Holm, Director, Sókaart Archivet.*

China. "The best geographical dictionary is G. M. H. Playfair's Cities and Towns of China. London, Trubner & Co., 1879."—*A. M. Bisbee, Coast Inspector.*

Austria-Hungary. "We have for every province in the empire official repertories of the names of every place in it, viz.: Special Ortsrepertorium von Steiermark, Kärnten, Krain, Böhmen, etc.; also Geographisch Statistisches Repertorium der bewohnten Orte im Königreich Dalmatien, Slovnik Geografizmy (Geographisches Lexicon) des Königreichs Polen und anderer Slavischer Länder; Ortslexikon des Königreichs Polen; Ortschafts-und-Bevölkerungs-Statistik Bosniens und der Hercegovina. The names of places in the kingdom of Hungary are contained in the Ortslexikon von Ungarn by Jekelfalussy, and in the Postlexikon der Länder der ungarischen Krone. For the adjacent part of Russia, Ortslexikon von Russland. We consider generally the geographic appendix to Webster's Dictionary to contain the best system of the pronunciation of geographic appellations originating in different languages but spelled in English."—*F. Baron de Haan, Captain I. and R. Navy, Vorstand des K. K. Küstenbeschreibungs-Bureaus.*

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The third Bulletin of the United States Board on Geographic Names contains decisions rendered at the instance of the Light-House Board. They relate to geographical features upon the sea and lake coasts, and upon the navigable rivers of the United States, and concern merely the elision of the possessive form of the name. It is understood that the fourth Bulletin will relate to the names of counties, cities and towns.

DICTIONARY OF ALTITUDES.—The second edition of Mr. Henry Gannett's Dictionary of Altitudes* might well be called a *New Dictionary of Altitudes.* The large amount of new matter, and the substitution of a single alphabetic arrangement for an alphabetic arrangement by States gives it the character of a new work. The number of localities given is approximately twenty-four thousand, being an increase of about six thousand. The data are mainly from Government and State surveys, city engineers' reports, the Mississippi and Missouri River Commissions, and railroad corporations. As to the latter, that is to say, the profiles of railroads, the editor gives them a high value. Many of them, he says, are wonderfully accurate, some comparing favorably with the precise levelling of the Coast and Geodetic Survey, and the Mississippi and Missouri River Commissions. Mr. Gannett has in his possession abstracts of the profiles of more than *nine-tenths* of the railroad mileage of the country, which he finds of the greatest value in the preparation of topographic maps. He accepted the profiles of the Pennsylvania railroads, published in Appendix NN of the reports of the Second Geological Survey of Pennsylvania, but the profiles of

* U. S. Geol. Survey: Bulletin No. 76.

railroads in New Hampshire, Virginia, North Carolina, Alabama, Ohio, Indiana, Wisconsin, Minnesota and Iowa published in reports of geological surveys of those States, that were used quite fully in the first edition, have been in large part supplanted by profiles recently received from the railroads, "which are presumably more accurate." The adjustment of levels has been less perplexing than formerly, because of the lines of precise levels which have been run by the Coast Survey and the Mississippi and Missouri River Commissions. The changes of leading railroad centres by re-adjustments are not great. Cincinnati has been lowered eight feet, Kansas City has been raised two feet, Omaha one foot, and Denver seven feet. In the case of less important points, the changes have been, in many cases, of greater amount.

The work done by the War Department between 1850 and 1855 for the purpose of finding a practicable railroad route to the Pacific (*Pacific Railroad Reports*) Mr. Gannett says, taken as a whole is poor, owing mainly to the fact that practically there were no barometric base stations. The hypsometric work of the expedition near the northern boundary under Governor Stevens was particularly bad. These remarks concerning the quality of the work apply equally well to all the earlier expeditions to the west, owing doubtless to the same cause.

GEOLOGICAL PHOTOGRAPHS.—The Geologic Society of America has arranged for the collection, preservation and systematic registration of photographs of geologic interest in the United States. The object of the movement is to make a photo-geologic survey, and se-

XUM

cure a national collection of photographs illustrating the geology of the country in order that investigatiors may have material for comparative study, and teachers better illustrations to use in teaching geology. It has already received several hundred photographs, which have been classified, catalogued, and temporarily bound in the form of books; and a scale of prices arranged for mounted or unmounted copies. The committee, consisting of Prof. J. F. Kemp, Ithaca, N. Y.; Prof. W. M. Davis, Cambridge, Mass.; and J. S. Diller, U. S. Geol. Survey, Washington, solicit the donation of good photographs which clearly illustrate important geologic phenomena, among which may be mentioned typical views of eruptive and sedimentary rocks, of dikes, bosses, contacts, transitions, folds, faults, jointing, cleavage, weathering, glaciers, etc.

ALASKA.—The latest advices from the Alaska boundary survey party, dated June 20, 1891, are from Camp Davidson, Upper Yukon River, near eastern boundary. This survey, it will be remembered, is to secure data to be used by the Government in the negotiation, adjustment, and definite settlement and location of the boundary between Alaska and British Columbia, and is being made by the United States Coast and Geodetic Survey at the instance of the Department of State.

The health of the party, under Mr. J. E. McGrath, has been excellent in the main during two years in a severe region. The autumn months of 1890 proved very unfavorable, September being marked by almost continuous rain, and October and November very cloudy. On May 9th of this year the first interior contact of Mercury with the sun was observed, and on the

6th of June the partial eclipse of the sun. A number of photographs of both these phenomena were taken. Regular monthly sets of magnetics were observed through the whole season, and the declination was observed every fifteen minutes through twenty-four hours on one day in each month, during the last three months. Meteorological observations were carried through without interruption, readings being recorded three times a day.

Plenty of provisions came up for the party last year, as a great many of the articles, that were wrecked in 1889 belonging to both parties, were sent to one point (Camp Davidson), together with some supplies from the Alaska Commercial Company's stock at St. Michaels. As it happened that the traders at Forty mile creek did not receive much of a supply, the extra quantity that came was a welcome addition to the stock in the country, and was of material benefit to whites and Indians. Everything that could be spared was eagerly picked up, the white men paying for their goods in gold dust, and the Indians trading meat, moccasins, etc., for their share. Game was very scarce.

The average temperature of the months, after last December, showed an increase of a few degrees over the same months last year. The lowest minimum temperature was secured January 16th, viz. : 60° 5′ below zero.

Mr. McGrath expected to reach St. Michaels, homeward bound, by the 25th of August.

Dr. W. C. Kingsbury, the surgeon of the party, has already returned, having reached St. Louis—his home —August 23d. He says that valuable collections of small animals, birds, insects, and flowers have been se-

cured, that the country along the upper Yukon is fast filling up with people who have the gold fever, and that miners are excited over prospects of fortune. He also says that the result of the Government Survey has been most satisfactory.

Nothing has yet been heard from Mr. Israel C. Russell who went to Alaska via Icy Bay, under the auspices of the National Geographic Society to explore further the region about Mount St. Elias. H.

DETAILED HYDROGRAPHIC CHART

OF THE

ULTIMATE SOURCE

OF THE

MISSISSIPPI RIVER

DRAWN BY

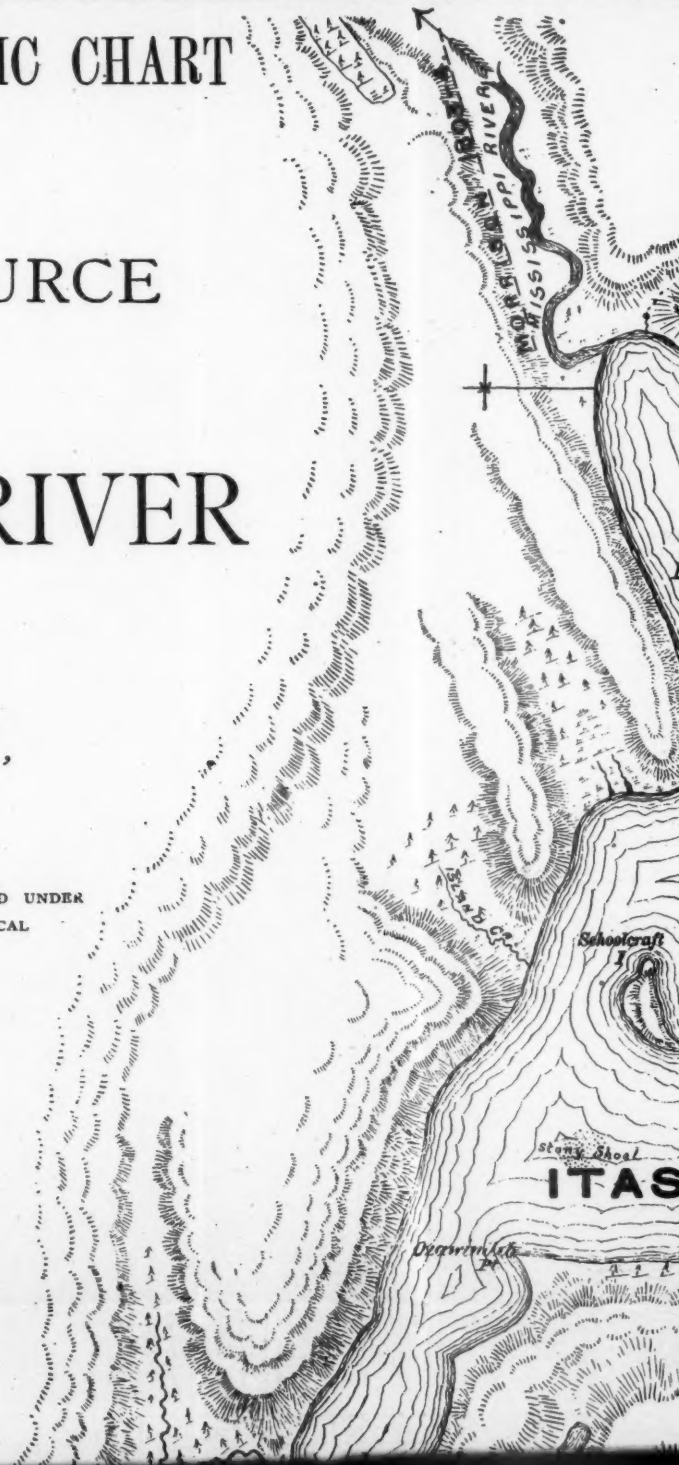
J. V. BROWER,

A COMMISSIONER,

IN CHARGE OF AN EXPEDITIONARY EXAMINATION, CONDUCTED UNDER THE AUTHORITY OF THE MINNESOTA STATE HISTORICAL SOCIETY, DURING THE YEAR 1889 AND THEREAFTER, AND ALSO COMMISSIONER OF THE ITASCA STATE PARK.

1891.

SCALE: Three inches to each statute mile of five thousand two hundred and eighty feet.



DISTANCE BY GOVERNMENT SURVEY, 8350 F.
TOWNSHIP LINE, 144 N., R. 36 W. OF 5TH PRINCIPAL MERIDIAN.
BASE LINE OF J. V. BROWER'S SURVEY.
ACTUAL DISTANCE, 8476 F.
T. 144.
R. 35.
N. W. CORNER OF HUBBARD CO.
T. 143. R. 36
T. 143. R. 35.
NORTH ARM
FLOATING BOG BAY
ASCA LAKE
RHODES HILL

DETAILED HYDROGRAPHIC CHART

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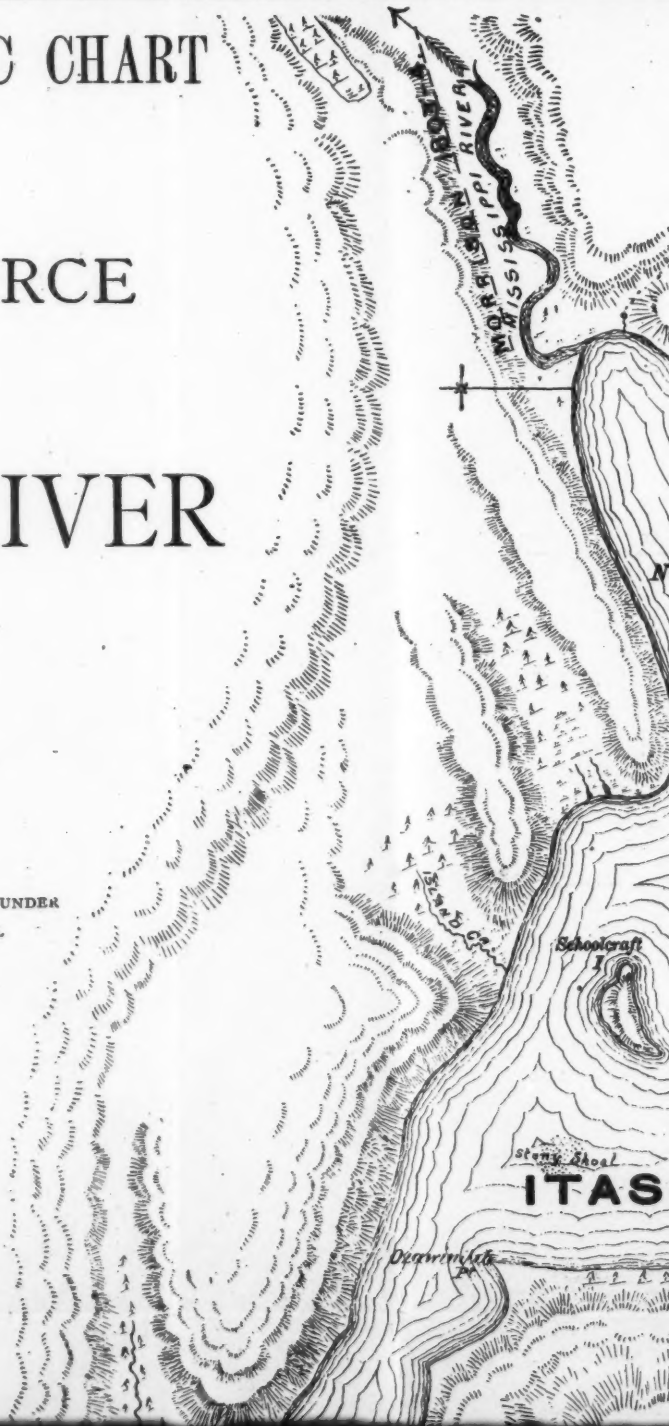

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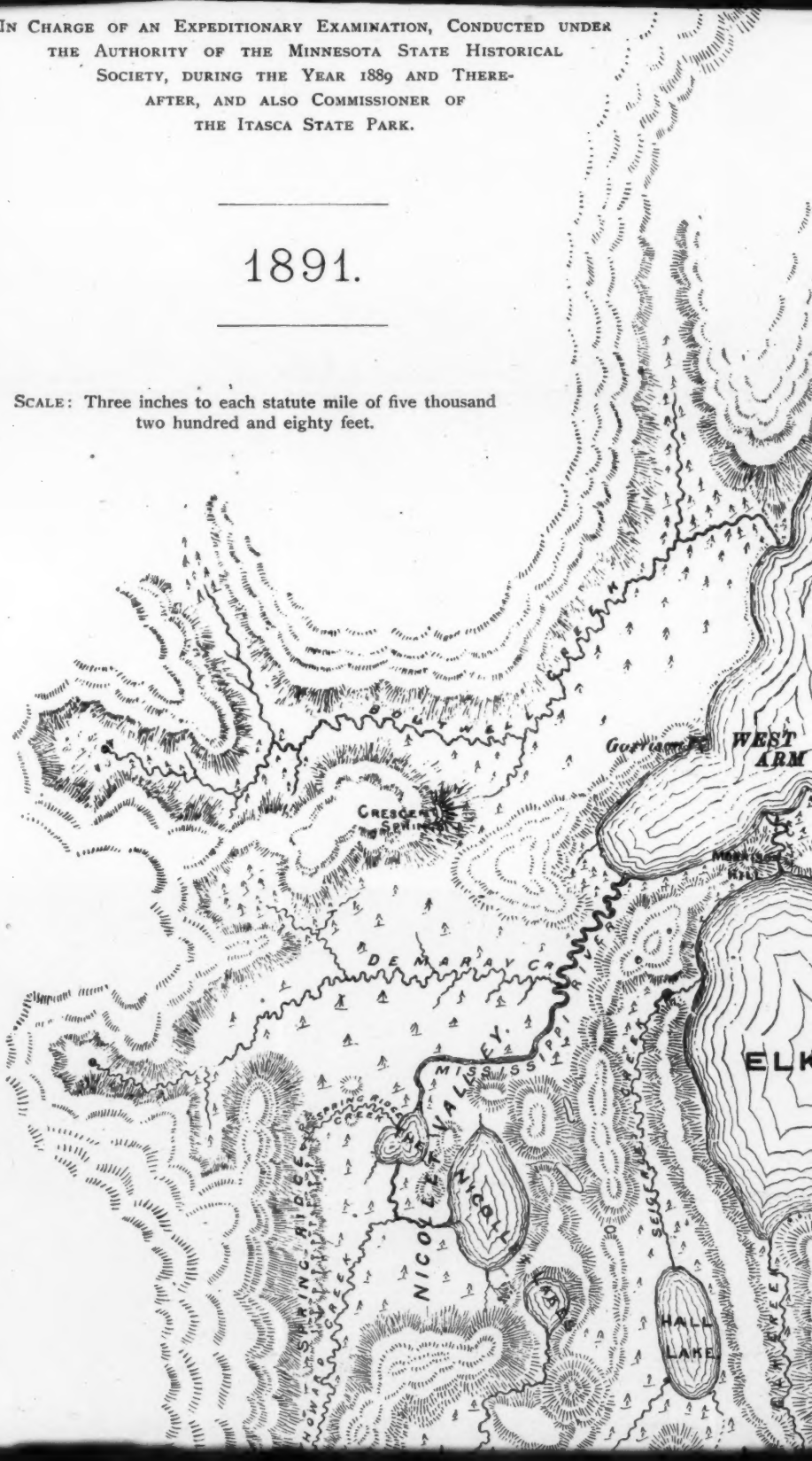
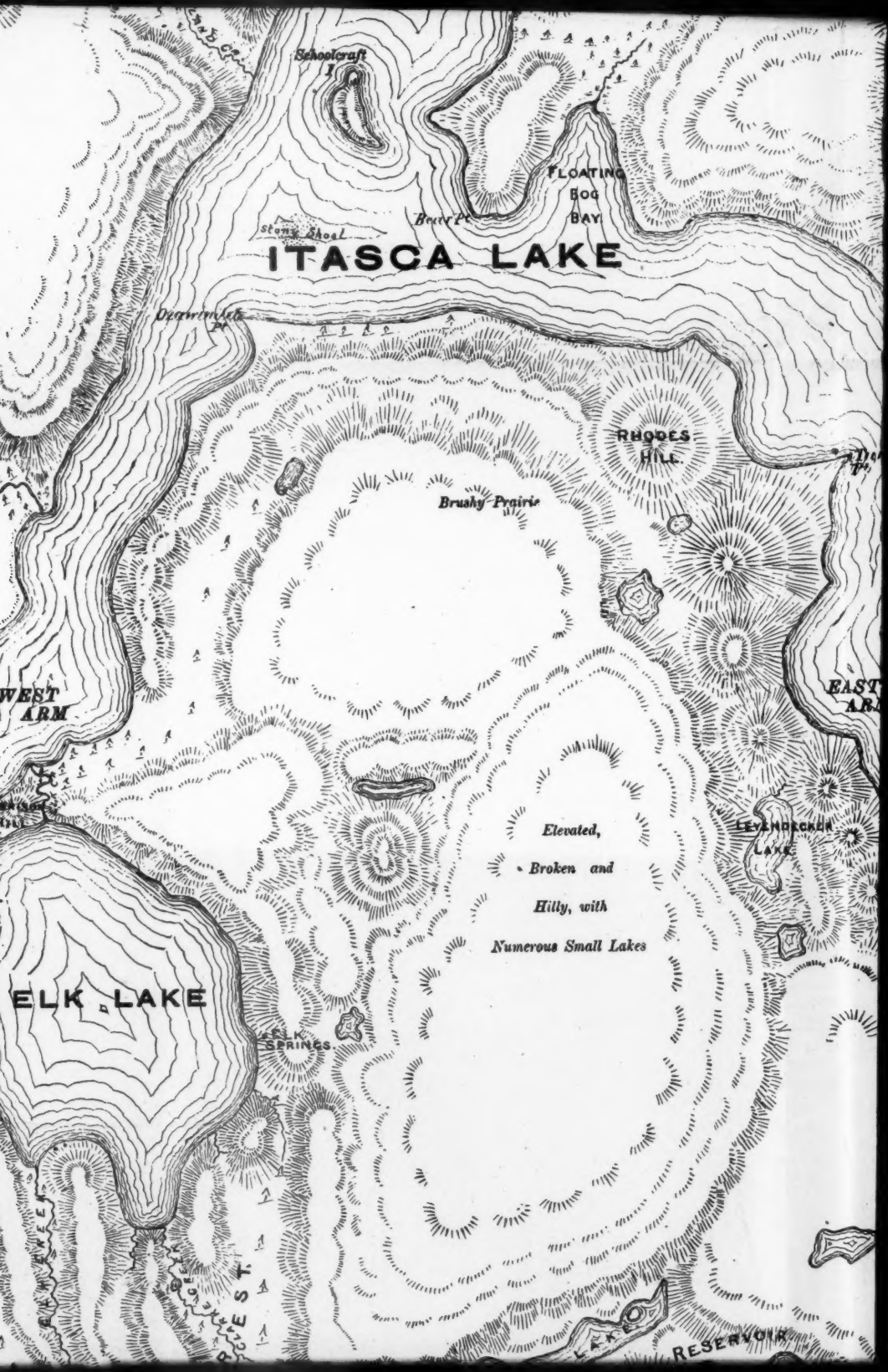
T. 143. R. 35.
NORTH ARM
FLOATING BOG BAY
ASCA LAKE
RHODES

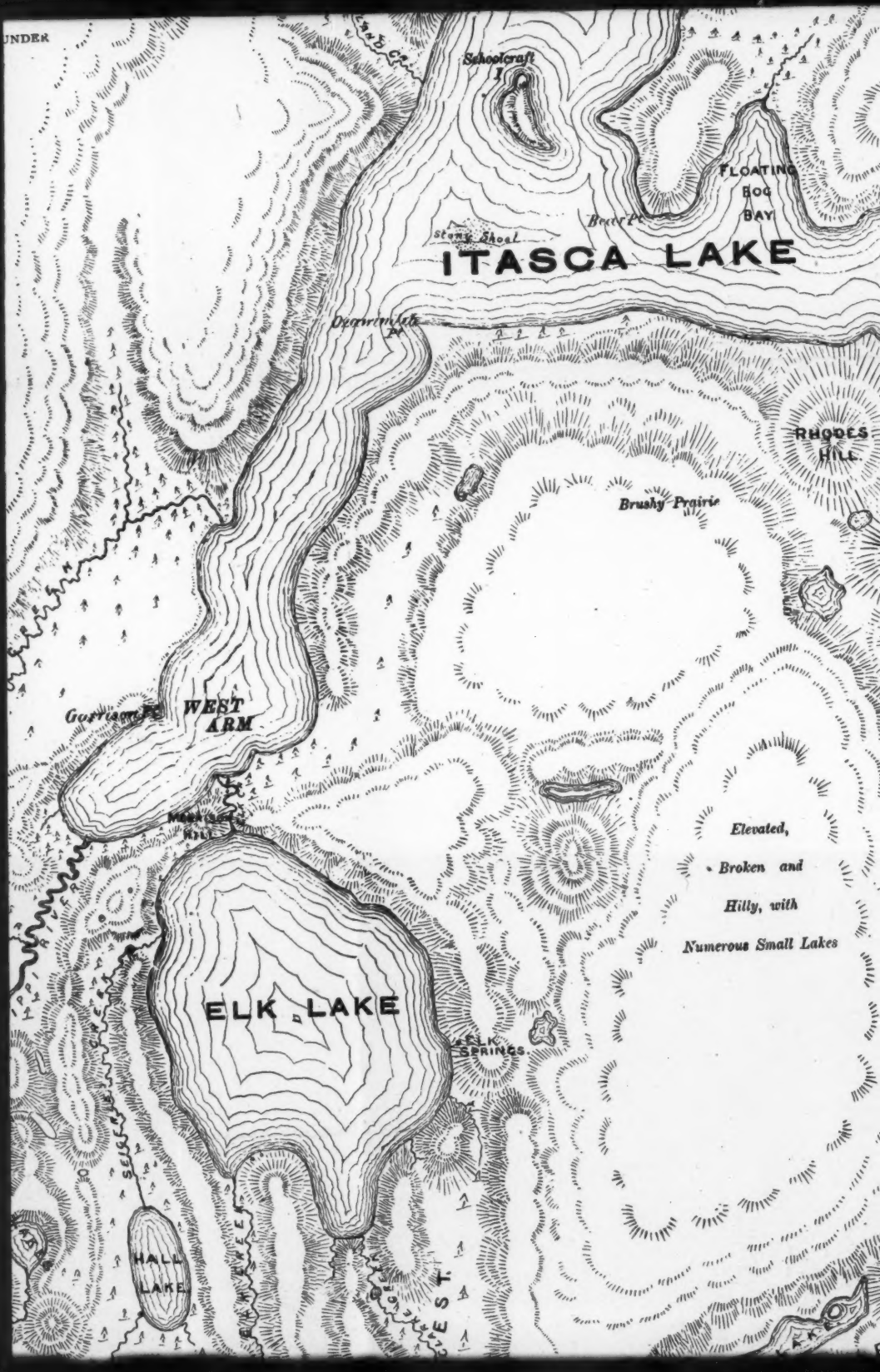
In Charge of an Expeditionary Examination, Conducted under the Authority of the Minnesota State Historical Society, during the Year 1889 and Thereafter, and also Commissioner of the Itasca State Park.

1891.

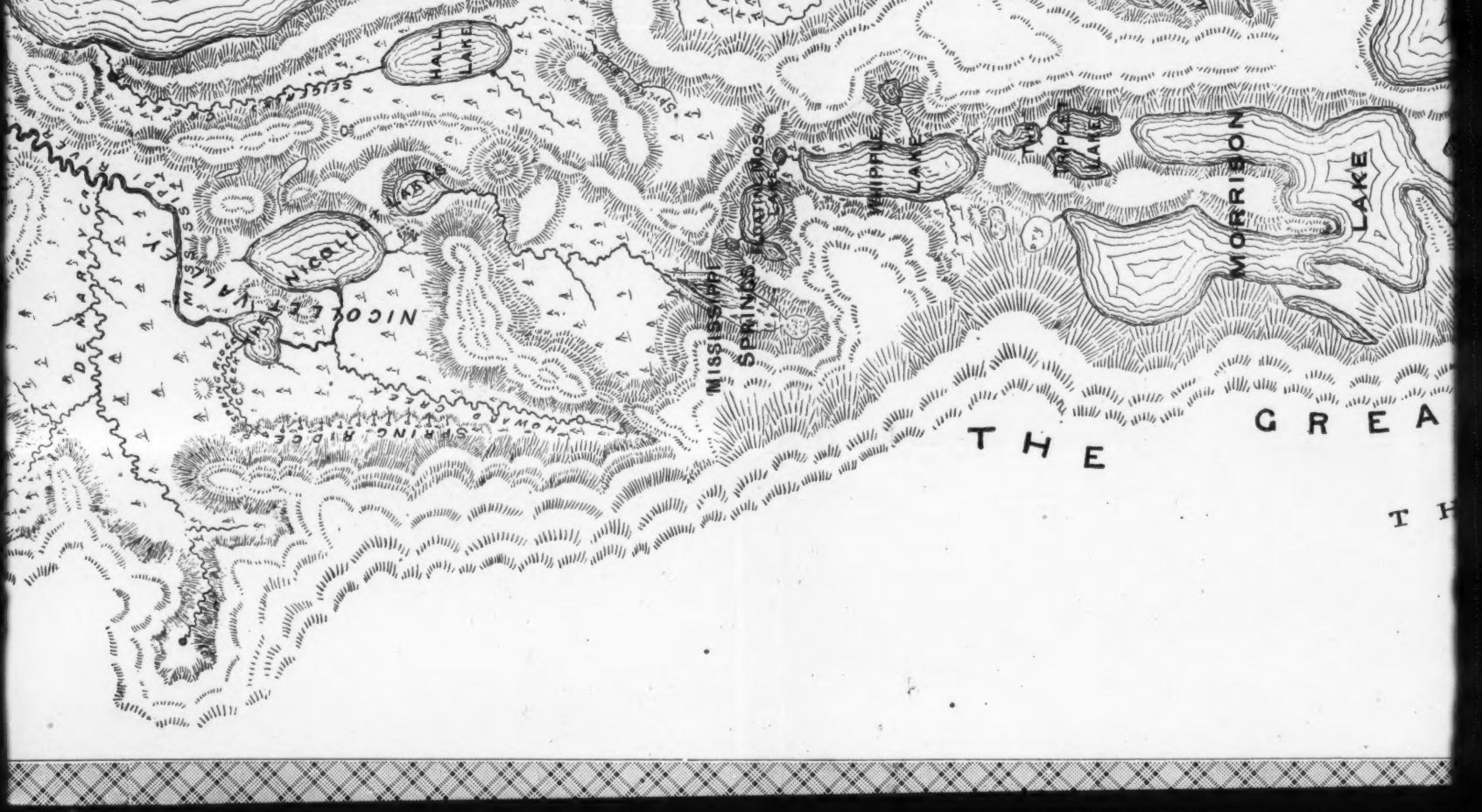
Scale: Three inches to each statute mile of five thousand two hundred and eighty feet.

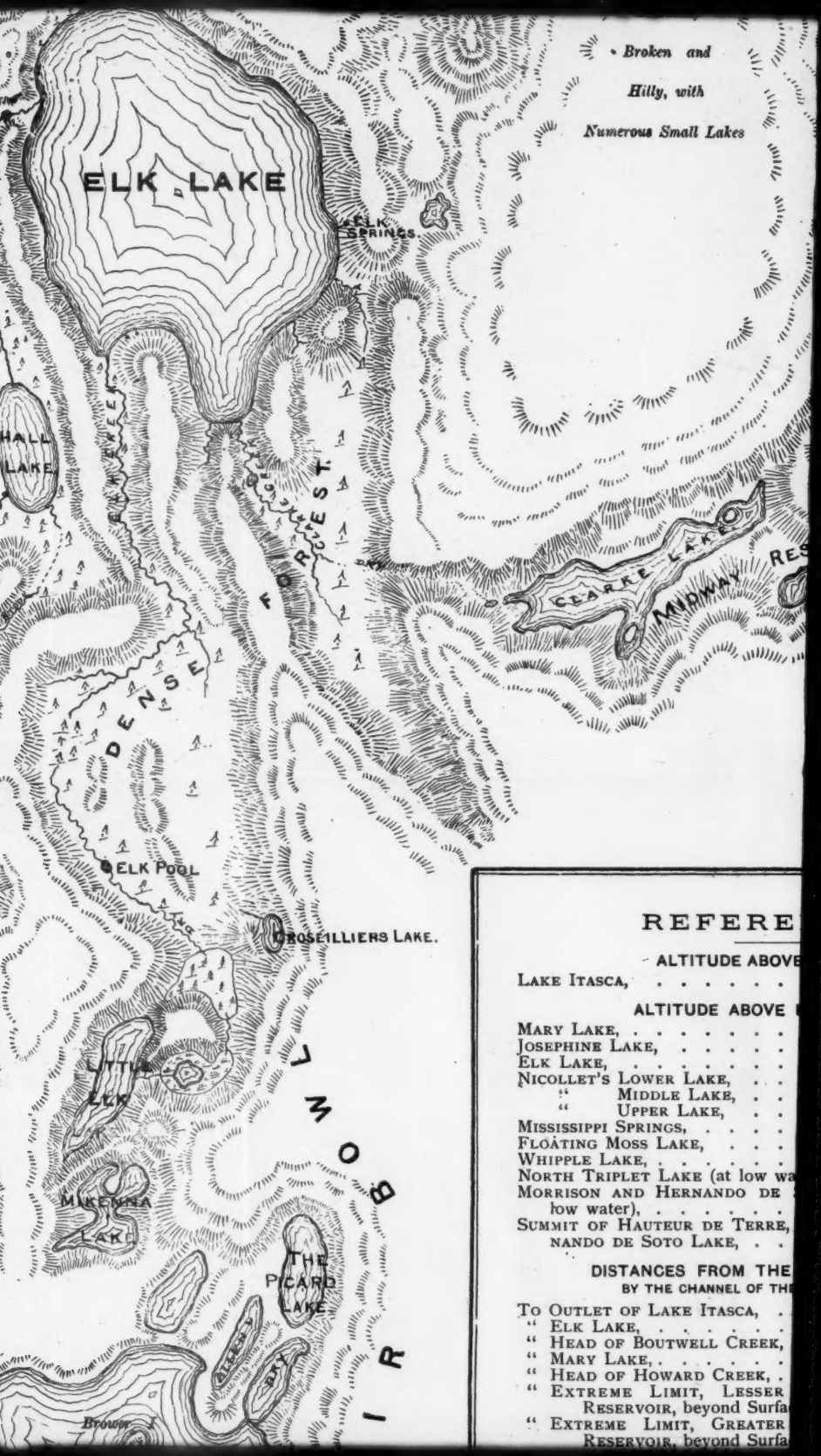


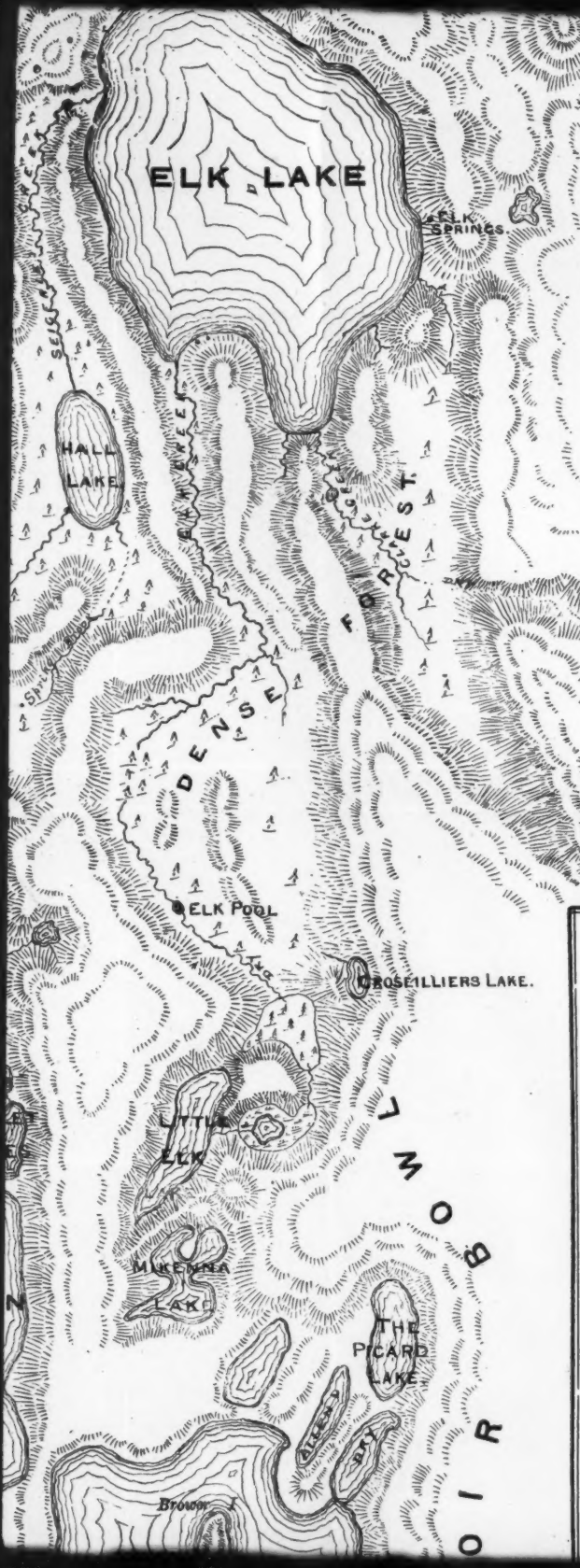

Schoolcraft I.
FLOATING BOG BAY
Stony Shoal
ITASCA LAKE
RHODES HILL
Brushy Prairie
WEST ARM
Elevated,
Broken and
Hilly, with
Numerous Small Lakes
LEVENDECKER LAKE
ELK LAKE
ELK SPRINGS
RESERVOIR


UNDER
Schoolcraft I.
FLOATING BOG BAY
Beaver Pt.
Stony Shoal
ITASCA LAKE
Deserted Isle
RHODES HILL
Brushy Prairie
Garrison Pt.
WEST ARM
Marshall Hill
Elevated, Broken and Hilly, with Numerous Small Lakes
ELK LAKE
ELK SPRINGS
HALL LAKE
WEST

HODES
HILL
EAST
ARM
SCHOOLCRAFT, 1832.
NICOLLET, 1836.
MARY
LAKE
RESERVOIR


HALL LAKE
NICOLET VALLEY
MISSISSAGI
SPRINGS
MISSISSAGI
WHIPPLE LAKE
MORRISON LAKE
THE
GREA
T H


Broken and
Hilly, with
Numerous Small Lakes
ELK LAKE
ELK SPRINGS
HALL LAKE
DENSE FOREST
CLARKE LAKE
MIDWAY
ELK POOL
ROSEILLIERS LAKE.
LITTLE ELK
MIKENNA LAKE
THE PICARD LAKE
BOWL
REFERE
ALTITUDE ABOVE
LAKE ITASCA,
ALTITUDE ABOVE
MARY LAKE,
JOSEPHINE LAKE,
ELK LAKE,
NICOLLET'S LOWER LAKE,
" MIDDLE LAKE,
" UPPER LAKE,
MISSISSIPPI SPRINGS,
FLOATING MOSS LAKE,
WHIPPLE LAKE,
NORTH TRIPLET LAKE (at low wa
MORRISON AND HERNANDO DE
low water),
SUMMIT OF HAUTEUR DE TERRE,
NANDO DE SOTO LAKE,
DISTANCES FROM THE
BY THE CHANNEL OF TH
TO OUTLET OF LAKE ITASCA,
" ELK LAKE,
" HEAD OF BOUTWELL CREEK,
" MARY LAKE,
" HEAD OF HOWARD CREEK,
" EXTREME LIMIT, LESSER
RESERVOIR, beyond Surfa
" EXTREME LIMIT, GREATER
RESERVOIR, beyond Surfa



REFERENC

ALTITUDE ABOVE THE

Lake Itasca,	

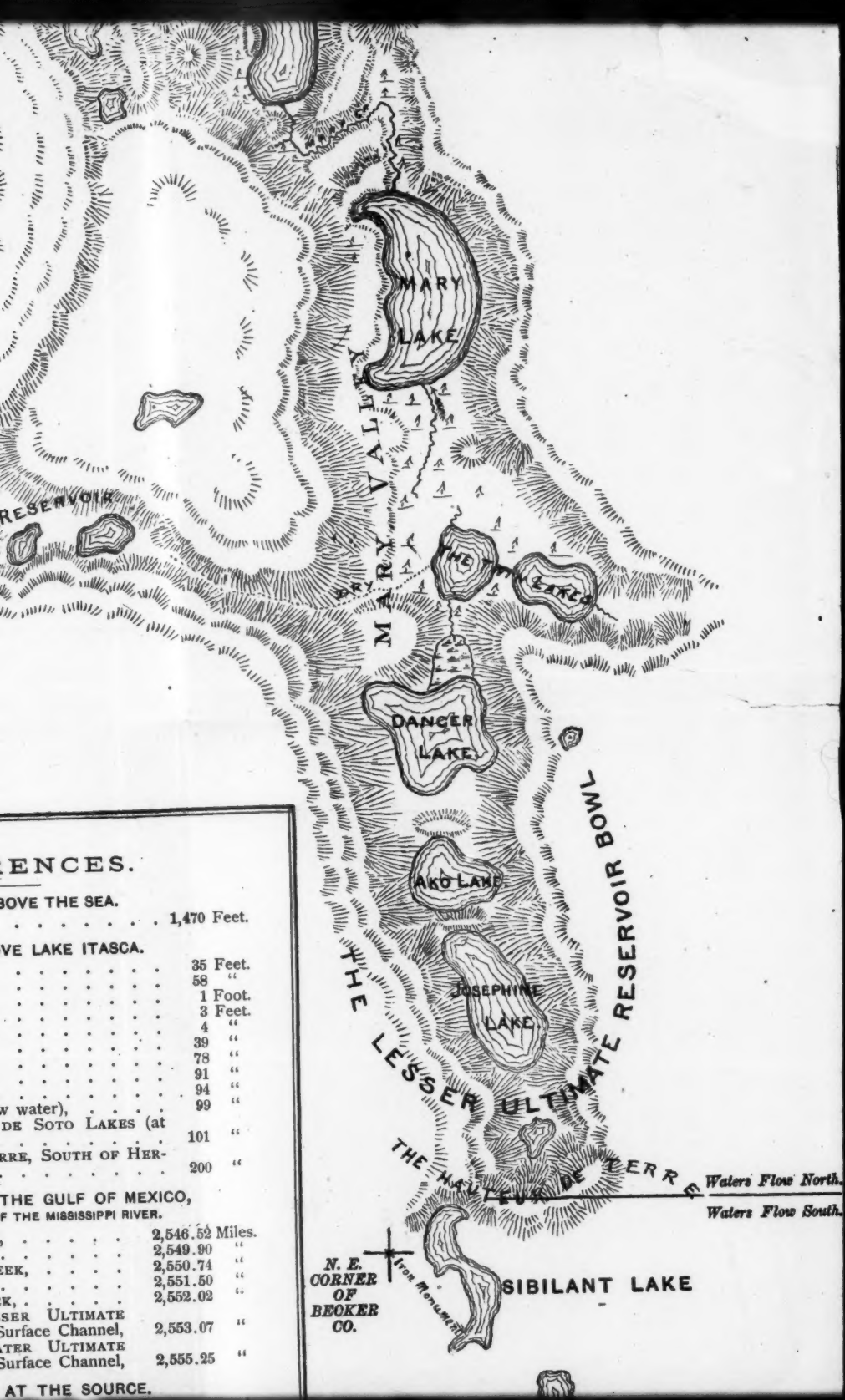
ALTITUDE ABOVE LAKE

Mary Lake,	
Josephine Lake,	
Elk Lake,	
Nicollet's Lower Lake,	
" Middle Lake,	
" Upper Lake,	
Mississippi Springs,	
Floating Moss Lake,	
Whipple Lake,	
North Triplet Lake (at low water),	
Morrison and Hernando de Soto low water),	
Summit of Hauteur de Terre, Sout nando de Soto Lake,	

DISTANCES FROM THE GULF
BY THE CHANNEL OF THE MISSIS

To Outlet of Lake Itasca,	
" Elk Lake,	
" Head of Boutwell Creek,	
" Mary Lake,	
" Head of Howard Creek,	
" Extreme Limit, Lesser Ulti Reservoir, beyond Surface Cha	
" Extreme Limit, Greater Ulti Reservoir, beyond Surface Cha	

DISCOVERIES AT THE



RENCES.

BOVE THE SEA.

. . . . .	1,470 Feet.

VE LAKE ITASCA.

. . . . .	35 Feet.
. . . . .	58 "
. . . . .	1 Foot.
. . . . .	3 Feet.
. . . . .	4 "
. . . . .	39 "
. . . . .	78 "
. . . . .	91 "
. . . . .	94 "
w water), ...	99 "
DE SOTO LAKES (at	101 "
RRE, SOUTH OF HER-	200 "

THE GULF OF MEXICO,
F THE MISSISSIPPI RIVER.

. . . . .	2,546.52 Miles.
. . . . .	2,549.90 "
EEK, ...	2,550.74 "
. . . . .	2,551.50 "
K, ...	2,552.02 "
SER ULTIMATE Surface Channel,	2,553.07 "
ATER ULTIMATE Surface Channel,	2,555.25 "

AT THE SOURCE.

THE GREATER ULTIMATE

HAUTEURS

THE

WHIPPLE LAKE

ELK POO

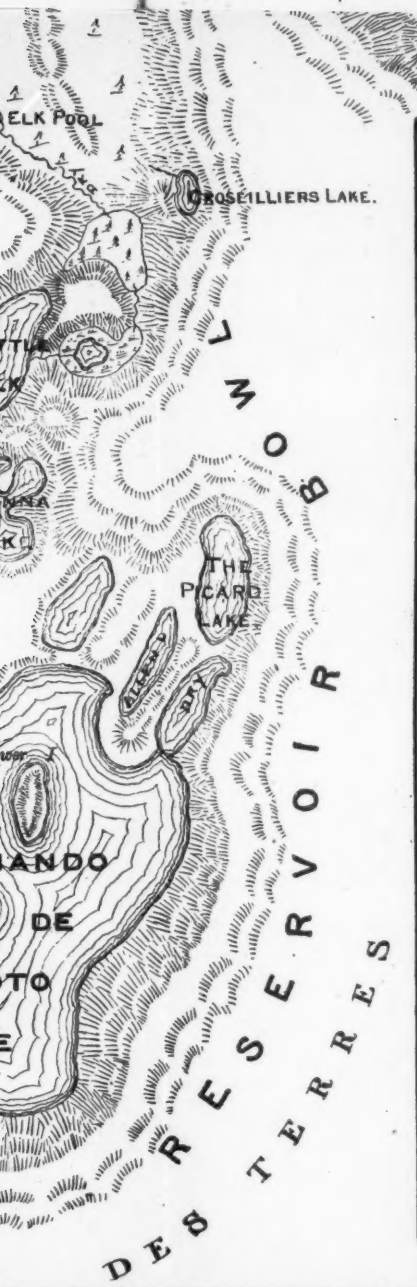
THE TRIPLET LAKES

LITTLE ELK

MIRENNA LAKE

MORRISON LAKE

HERNAND DE SOTO LAKE



REFERENCES.

ALTITUDE ABOVE THE SEA.

Lake Itasca,	1,470 Feet.

ALTITUDE ABOVE LAKE ITASCA.

Mary Lake,	35 Feet.
Josephine Lake,	58 "
Elk Lake,	1 Foot.
Nicollet's Lower Lake,	3 Feet.
" Middle Lake,	4 "
" Upper Lake,	39 "
Mississippi Springs,	78 "
Floating Moss Lake,	91 "
Whipple Lake,	94 "
North Triplet Lake (at low water),	99 "
Morrison and Hernando de Soto Lakes (at low water),	101 "
Summit of Hauteur de Terre, South of Hernando de Soto Lake,	200 "

DISTANCES FROM THE GULF OF MEXICO,
BY THE CHANNEL OF THE MISSISSIPPI RIVER.

To Outlet of Lake Itasca,	2,546.52 Miles.
" Elk Lake,	2,549.90 "
" Head of Boutwell Creek,	2,550.74 "
" Mary Lake,	2,551.50 "
" Head of Howard Creek,	2,552.02 "
" Extreme Limit, Lesser Ultimate Reservoir, beyond Surface Channel,	2,553.07 "
" Extreme Limit, Greater Ultimate Reservoir, beyond Surface Channel,	2,555.25 "

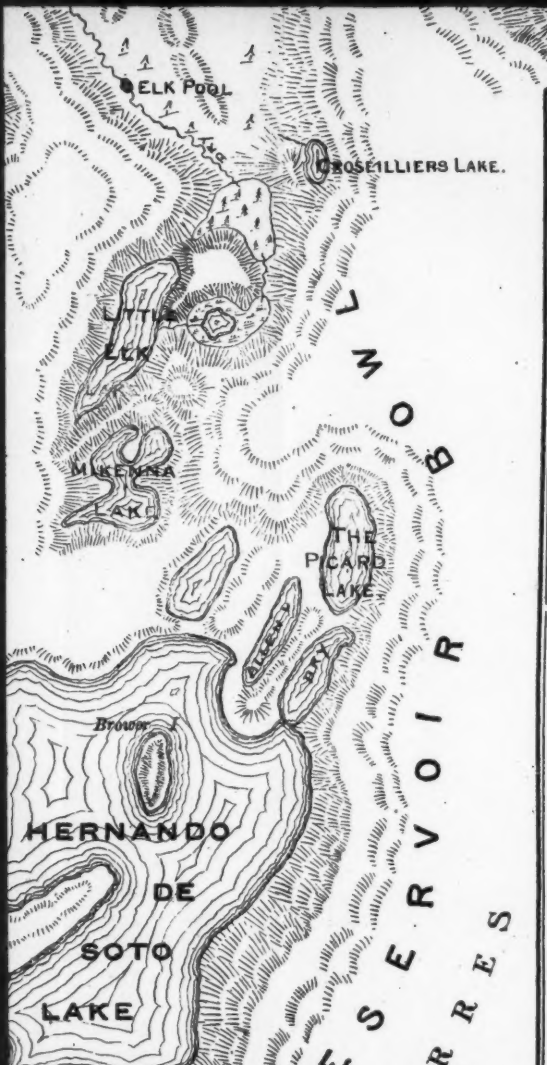
DISCOVERIES AT THE SOURCE.

Earliest Probable Occupants,	Prehistoric.
Earliest Known Occupants,	Aboriginal.
First Known of White Men,	William Morrison, 1803.
First Authentic Discovery, Lake Itasca,	H. R. Schoolcraft, 1832.
Second Authentic Discovery, Principal Stream,	J. N. Nicollet, 1836.
Third Authentic Discovery, Elk Lake,	Julius Chambers, 1872.
Fourth Authentic Discovery, United States Survey,	Edwin S. Hall, 1875.
Fifth Authentic Discovery, Special Survey,	Hopewell Clarke, 1886.

GEOGRAPHIC POSITION.

Schoolcraft Island,	North Latitude 47° 13′ 10″. Longitude West from G., 95° 12′.
Brower Island,	North Latitude 47° 8′ 50″. Longitude West from G., 95° 12′ 48″.

PIONEER PRESS, ST. PAUL, MINN.



REFERENCE

ALTITUDE ABOVE THE SE

LAKE ITASCA, ...

ALTITUDE ABOVE LAKE IT

MARY LAKE, ...
JOSEPHINE LAKE, ...
ELK LAKE, ...
NICOLLET'S LOWER LAKE, ...
" MIDDLE LAKE, ...
" UPPER LAKE, ...
MISSISSIPPI SPRINGS, ...
FLOATING MOSS LAKE, ...
WHIPPLE LAKE, ...
NORTH TRIPLET LAKE (at low water), . .
MORRISON AND HERNANDO DE SOTO LA
low water), ...
SUMMIT OF HAUTEUR DE TERRE, SOUTH O
NANDO DE SOTO LAKE, ...

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BY THE CHANNEL OF THE MISSISSIPI

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" HEAD OF BOUTWELL CREEK, . . .
" MARY LAKE, ...
" HEAD OF HOWARD CREEK, ...
" EXTREME LIMIT, LESSER ULTIMA
RESERVOIR, beyond Surface Channe
" EXTREME LIMIT, GREATER ULTIMA
RESERVOIR, beyond Surface Channe

DISCOVERIES AT THE SOU

EARLIEST PROBABLE OCCUPANTS, . . .
EARLIEST KNOWN OCCUPANTS, ...
FIRST KNOWN OF WHITE MEN, . . . Will
FIRST AUTHENTIC DISCOVERY, Lake
Itasca, ... H.
SECOND AUTHENTIC DISCOVERY, Princi-
pal Stream, ...
THIRD AUTHENTIC DISCOVERY, Elk
Lake, ... Jul
FOURTH AUTHENTIC DISCOVERY, United
States Survey, ... E
FIFTH AUTHENTIC DISCOVERY, Special
Survey, ... Hoy

GEOGRAPHIC POSITION

SCHOOLCRAFT ISLAND, { North L
Longitude West fr
BROWER ISLAND, . . { North L
Longitude West fr

PIONEER PRESS, ST. PAUL, MINN.

ENCES.

VE THE SEA.

. . . . .	1,470 Feet.

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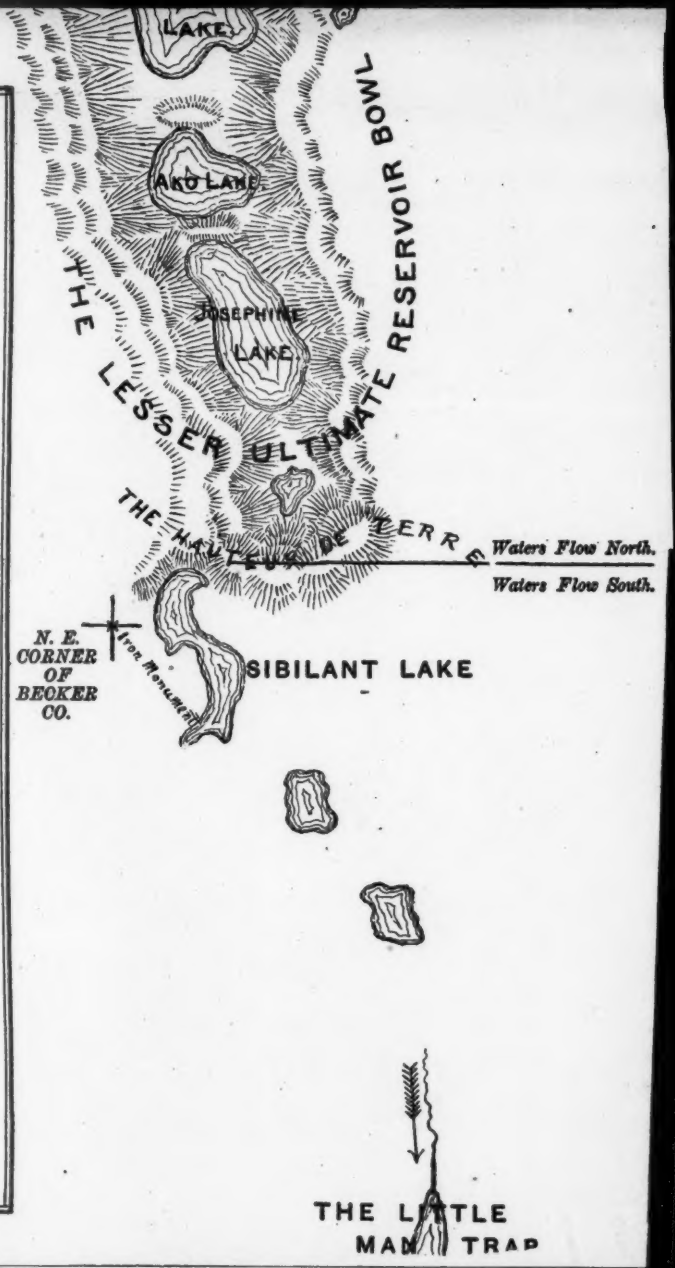

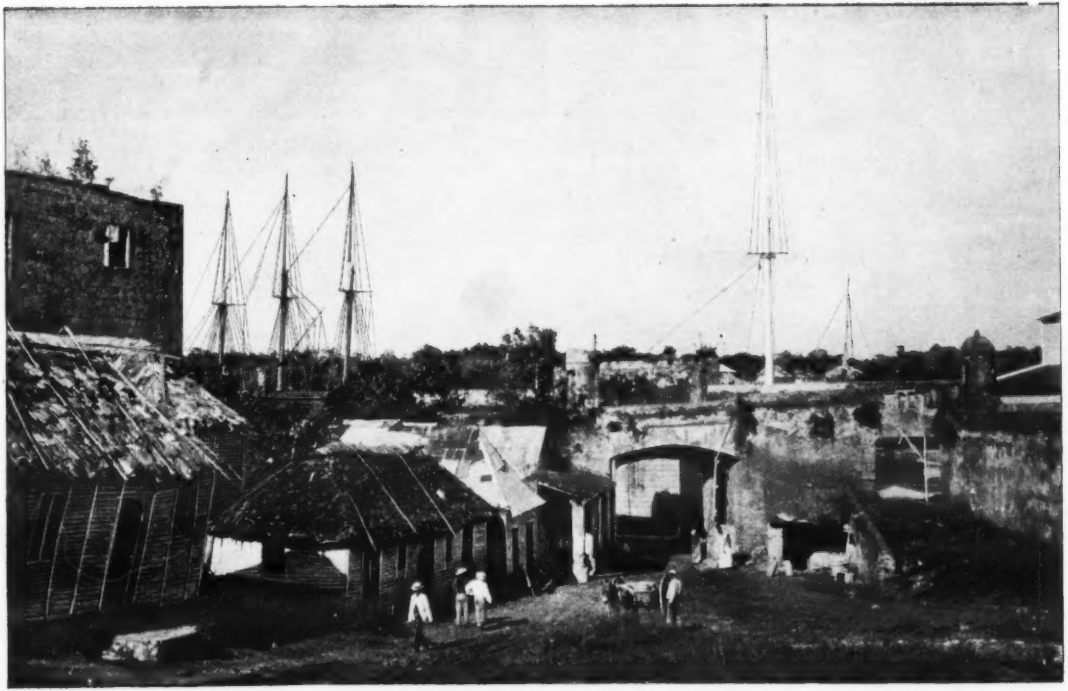

DON DIEGO GATE AND PALACE, SANTO DOMINGO.